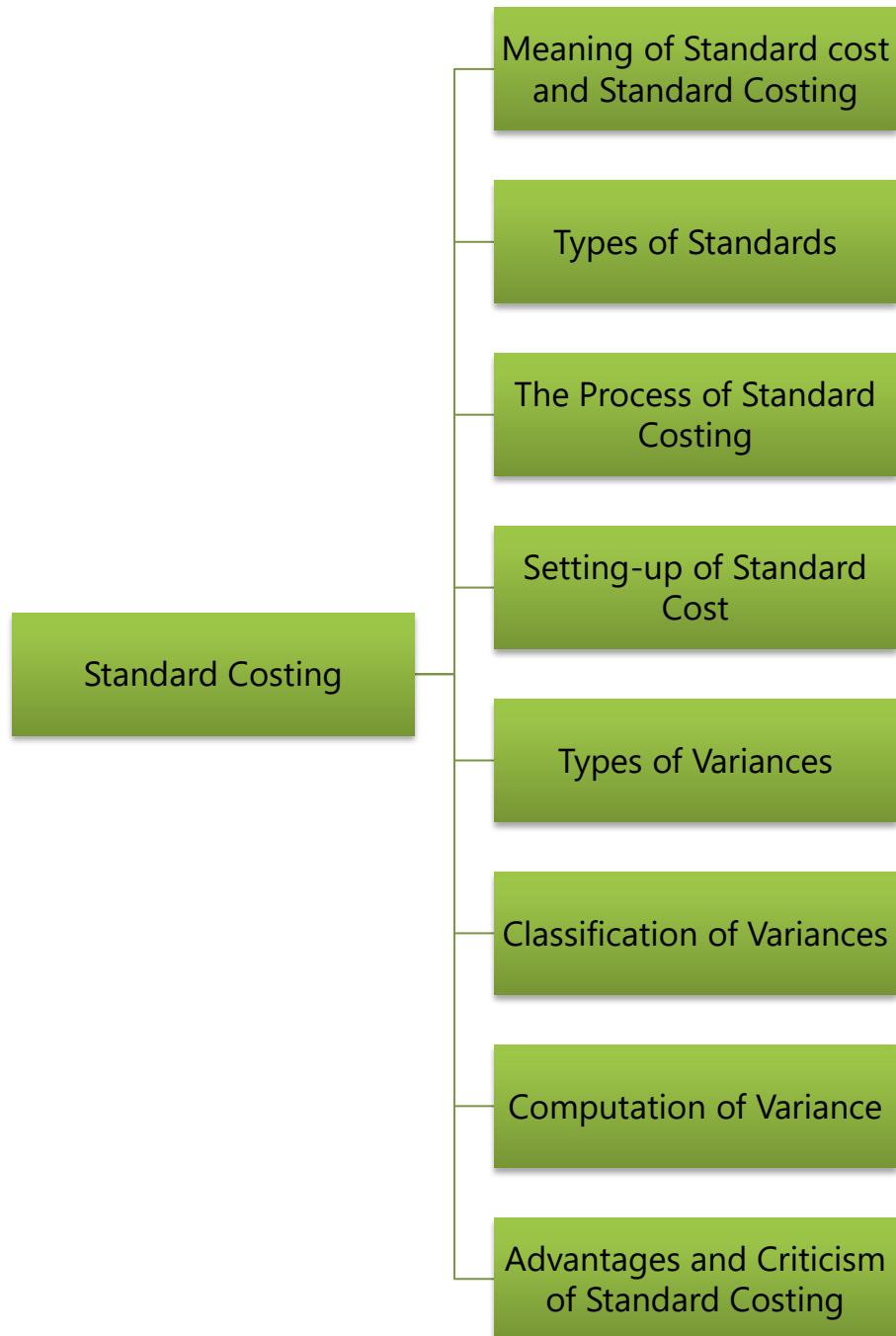


STANDARD COSTING



LEARNING OUTCOMES

- ❑ Discuss the meaning of standard cost and variances.
- ❑ Differentiate between controllable and uncontrollable variances.
- ❑ Analyse and compute variances related to material, labour and overheads.

CHAPTER OVERVIEW



13.1 INTRODUCTION

Cost control is one of the objectives of cost management. Management of an organisation setups predetermined cost to compare the actual cost with the predetermined cost. Predetermined costs are standard costs used for cost control and performance evaluation. Standard costing is a method of cost and management accounting which starts with setting of standards and ends with reporting of variances to management for taking corrective actions. The Official Terminology of CIMA, London defines standard costing as "Control technique that reports variances by comparing actual costs to pre-set standards so facilitating action through management by exception."

In this chapter we will learn how standards are set for each cost component i.e. material, labour and overheads of a cost object.

13.1.1 What is a Standard or Standard Cost?

Standard cost is defined in the CIMA Official Terminology as "the planned unit cost of the product, component or service produced in a period. The standard cost may be determined on a number of bases. The main use of standard costs is in performance measurement, control, stock valuation and in the establishment of selling prices." From the above definition Standard costs can be said as

- Planned cost
- Determined on a base or number of bases.

13.1.2 Why Standard Costing is Needed?

Standards or Standard costs are established to evaluate performance of a responsibility centre. Apart from performance evaluation and cost control, standard costs are also used to value inventory where actual figures are not reliably available and to determine selling prices particularly while preparing quotations.

Standard costing system is widely accepted as it serves different needs of an organisation. The standard costing is preferred for the following reasons:

- Prediction of future cost for decision making:** Standard costs are set after taking all present conditions and future possibilities into consideration. Hence, standard cost is future cost for the purpose of cost estimation and profitability from a proposed project/ order/ activity.
- Provide target to be achieved:** Standard costs are the target cost which should not be crossed by the responsibility centres. Performance of a

responsibility centre is continuously monitored and measured against the set standards. Any variance from the standard is noted and reported for appropriate action.

- (c) **Used in budgeting and performance evaluation:** Standard costs are used to set budgets and based on these budgets managerial performance is evaluated. This is of two benefits, one managers of a responsibility centre will not compromise with the quality to fulfill the budgeted quantity and second, variances can be traced with the responsible department or person.
- (d) **Interim profit measurement and inventory valuation:** Actual profit can only be known after the closure of the accounts. But an organisation may need to prepare profitability statement for interim periods for managerial reporting and decision making. To arrive at profit figure, standard costs are deducted from the revenue.



13.2 TYPES OF STANDARDS

Types of standards are as below:

(i) Ideal Standards: These represent **the level of performance attainable when prices for material and labour are most favourable**, when the highest output is achieved with the best equipment and layout and when the maximum efficiency in utilisation of resources results in maximum output with minimum cost.

These types of standards are criticised on three grounds:

- (a) Since such standards would be unattainable, no one would take these seriously.
- (b) The variances disclosed would be variances from the ideal standards. These would not, therefore, indicate the extent to which they could have been reasonably and practically avoided.
- (c) There would be no logical method of disposing of these variances.

(ii) Normal Standards: These are **standards that may be achieved under normal operating conditions**. The normal activity has been defined as "the number of standard hours which will produce at normal efficiency sufficient good to meet the average sales demand over a term of years".

These standards are, however, difficult to set because they require a degree of forecasting. The variances thrown out under this system are deviations from normal efficiency, normal sales volume, or normal production volume.

If the actual performance is found to be abnormal, large variances may result and necessitate revision of standards.

(iii) Basic or Bogey Standards: These standards are used only when they are likely to remain constant or unaltered over a long period. According to this standard, a base year is chosen for comparison purposes in the same way as statisticians use price indices. Since basic standards do not represent what should be attained in the present period, current standards should also be prepared if basic standards are used. Basic standards are, however, well suited to businesses having a small range of products and long production runs. Basic standards are set, on a long-term basis and are seldom revised. When basic standards are in use, variances are not calculated. Instead, the actual cost is expressed as a percentage of basic cost. The current cost is also similarly expressed and the two percentages are compared to find out how much the actual cost has deviated from the current standard. The percentages are next compared with those of the previous periods to establish the trend of actual and current standard from basic cost.

(iv) Current Standards: These standards reflect the management's anticipation of what actual costs will be for the current period. These are the costs which the business will incur if the anticipated prices are paid for the goods and services and the usage corresponds to that believed to be necessary to produce the planned output.

The variances arising from expected standards represent the degree of efficiency in usage of the factors of production, variation in prices paid for materials and services and difference in the volume of production.



13.3 THE PROCESS OF STANDARD COSTING

The process of standard cost is as below:

(i) Setting of Standards: The first step is to set standards which are to be achieved, the process of standard setting is explained below.

(ii) Ascertainment of actual costs: Actual cost for each component of cost is ascertained. Actual costs are ascertained from books of account, material invoices, wage sheet, charge slip etc.

(iii) Comparison of actual cost with standard cost: Actual costs are compared with the standards costs and variances are determined.

(iv) Investigate the reasons for variances: Variances arises are investigated for further action. Based on this, performance is evaluated and appropriate actions are taken.

(v) **Disposition of variances:** Variances arise are disposed-off by transferring it the relevant accounts (costing profit and loss account) as per the accounting method (plan) adopted.



13.4 SETTING UP OF STANDARD COST

Standard cost is set on the basis of management's estimation. Cost is estimated on the basis of technical specification provided by the engineering department or other expert such as production engineer. Generally, while setting standards, consideration is given to historical data, current production plan and expected conditions of future. For the sake of detailed analysis and control, standard cost is set for each element of cost i.e. material, labour, variable overheads and fixed overheads. Standard are also set for the sales quantity and sales value; this is generally known as budgeted sales.

Standards are set in both quantity (units or hours) and in cost (price or rate). It is thus measure in quantities, hours and value of the factors of production.

Standard costs are divided into three main cost components, such as

- (a) Direct Material Cost
- (b) Direct Employee (Labour) Cost and
- (c) Overheads

Standards are set in both physical and monetary terms for each cost components. Details are as follows:

13.4.1 Physical Standards

Physical standards refer to expression of standards in units or hours. At this stage standard quantity and standard hours are determined for a particular product or service. The purpose of setting standards is to secure economies in scale of production and to set selling price for quotation purpose.

In manufacturing organisations, the task of setting physical standards is assigned to the industrial engineering department. While setting standards consideration is given to :

- Company's operating plan i.e. budgets
- Final output to be produced
- Material specification, in both quantity and quality provided by the engineering department.
- Proportion of material to be used in case of multiple inputs.

- Method of production i.e. fully automated, semi-automated or manual.
- Skill set of workers and availability of workers.
- Working conditions and internal factors.
- External factors (such as Labour Law, Factories Act, Govt. policy etc.).

PROCEDURE OF SETTING MATERIAL QUANTITY STANDARDS

The following procedure is usually followed for setting material quantity standards.

- (a) Standardisation of products:** At this phase, products to be produced are decided based on production plan and customer's order. Generally following questions are answered at this stage: (i) What to be produced? (ii) Which type to be produced and (iii) How much to be produced?
- (b) Product study:** Product to be produced is analysed and studied for developments and production. Product study is carried out by the engineering department or product consultants. At this phase answers to the following questions are satisfied: (i) How can it be produced? (ii) What are the pre-requisites? (iii) Which type of materials to be used? (iv) How products can be accepted in the market? etc.
- (c) Preparation of specification list:** After the product study a list of material is prepared. It specifies types (quality) and quantity of materials to be used, substitute of the materials, quantity and proportion of materials to be used, process to be followed, pre-requisites and condition required etc. While preparing specification list consideration to expected amount of wastage is given. It must be customised to adopt changes in the product.
- (d) Test runs:** Sample or test runs under specified conditions are carried out and sample products are tested for the desired quality and quantity. Any deviation from the specification is noted down and specification list is updated.

PROCEDURE OF SETTING LABOUR TIME STANDARDS

The following are the steps involved in setting labour standards:

- (a) Standardisation** of product and product study is carried out as explained above.
- (b) Labour specification:** Types of labour and labour time is specified. Labour time specification is based on past records and it takes into account normal wastage of time.

- (c) **Standardisation of methods:** Selection of proper machines to use proper sequence and method of operations.
- (d) **Manufacturing layout:** A plan of operation for each product listing the operations to be performed is prepared.
- (e) **Time and motion study:** It is conducted for selecting the best way of completing the job or motions to be performed by workers and the standard time which an average worker will take for each job. This also takes into account the learning efficiency and learning effect.
- (f) **Training and trial:** Workers are trained to do the work and time spent at the time of trial run is noted down.

PROCEDURE OF SETTING OVERHEADS TIME/ QUANTITY STANDARDS

Variable overhead time/ quantity is estimated based on specification made by the engineering departments. Variable overheads may either be based on direct material quantity or labour hour. Generally, it is based on labour time worked.

Fixed overhead time is based on budgeted production volume.

13.4.1.1 Problems faced while setting physical standards

The problems involved while setting physical standards will vary from industry to industry and may be illustrated as under:

- (a) A situation may arise where the company is introducing the manufacture of a new line of product. In such case, it may be necessary to employ workers who have no experience in the job. This creates a problem of setting standard time because it is necessary to make adjustment for the inexperience of workers.
- (b) Changes in technology may necessitate installation of sophisticated machines. When such machines are installed, the precise estimation of output and standard of efficiency achievable will pose a problem until after a long time when the working conditions are settled. Thus, setting standards for these machines and estimating the standard costs will need considerable amount of work.
- (c) Often manufacturers prefer to product diversification to improve profitability. One of the most important problems that arise with the proposed change in product is re-setting of production facilities. For example, when an old copper part is to be changed into one made of bronze to suit the new product, special care has to be taken to order new

tools which in turn, pose the problem of setting up of standard time in respect of the new tools.

- (d) Standards of material specifications are established and if the materials are not available as per specifications, the standards may not be achievable.
- (e) Very often the cost accountant is confronted with the problem of choosing the type of standards to be adopted. For example, the industrial engineer has furnished the standard time for all direct labour operations as under:
 - 1. Standard time attainable by the best operations is 2 hours per unit of product including allowances for personal fatigue and delay.
 - 2. Attainable good performance for the average trained operator is 2.10 hours per unit of product.
 - 3. Average past performance is 2.60 hours per unit.

The problem is, should direct labour standard hour be based on maximum efficiency or attainable good performance or average past performance? If costs are to represent maximum efficiency, the unit cost used in selling price will relatively be low but a high debit variance may arise if the standard efficiency is not achieved.

If, however, the standard cost is based on attainable good performance, the variances may tend to be nil. If efficiency is to be gauged, maximum efficiency standard will reflect the off standard performance, thereby enabling the departmental head to exercise control.

Similar problems as those mentioned above, may also arise in setting of waste standards. For example, the question may arise as to whether only absolutely unavoidable wastage should be provided or the past average level of wastage may be provided. This will again have different impact on the standard cost of production.

13.4.2 Price or Rate Standards

Broadly, the price or rate standards can be set on either of the following bases:

- (a) Actual average or mean price expected to prevail during the coming period, say one year; or
- (b) Normal prices expected to prevail during a cycle of seasons which may be of a number of years.

PROCEDURES OF SETTING MATERIAL PRICE STANDARDS

Material prices are not altogether within the control of the manufacturer; but the purchasing department, on being apprised of production quantities required, should be able, from its knowledge of current market conditions and trends, to state with reasonable accuracy price for the constituent items. The standards for prices of materials should be based on the following factors, if price fluctuations are small and are not serious.

- (a) Stock of materials on hand and the prices at which they are held;
- (b) The prices at which orders for future deliveries of materials (agreement entered into) have already been placed,
- (c) Minimum support price fixed by the appropriate authority and
- (d) Anticipated fluctuation in price levels

In case there are unsystematic fluctuations in the market price, it may be difficult to determine standard costs of materials; fluctuations in the market price may be of different sorts; prices may be different from month to month, from one season to another or from one year to another. There may be a secular trend which, on the whole, is pushing price upwards or downwards. The nature of difficulties encountered in fixing standard costs of materials will naturally be different in each case. In addition, the purchasing policy of the company and the objective to be achieved (from cost accounting) will make a difference.

The difficulty in determining the standard cost of material in such a situation can be resolved as follows:

- (a) In case prices fluctuate from month to month, the average of prices of a year corrected for the known secular changes and any other expected change can very well serve as the standard price for the next year.
- (b) If the fluctuations are seasonal, but the whole year's requirements are purchased at one time, the weighted average of the likely prices to be paid should be treated as the standard price. But, if buying is also spread over the whole year, the weighted average of the prices for the whole year should be the standard price.

- (c) If prices fluctuate from one year to another, a careful estimate of the price likely to prevail next year, based on a statistical study, should be adopted as the standard price.

PROCEDURES OF SETTING WAGE RATE STANDARD

The type of labour required for performing a specific job would be the most important factor for deciding the rate of wage to be paid to workers. Standard wage rate for skilled and unskilled workers are set based on the following basis:

- Time taken by the workers to complete a unit of production.
- Time or piece rate prevailing in the industry. It can be known from the peers.
- Wage agreement entered into between the management and workers' union.
- Law prevailing in the area of operation, law like Payment of minimum wages Act, Payment of bonus Act etc.

PROCEDURES OF SETTING OVERHEAD EXPENSE STANDARDS

In computing the overhead expense standards, consideration should be given to the level of output and the budgeted expenses. A budgeted output is fixed considering practical manufacturing capacity and anticipated sales demand. Expenditures can be budgeted under different heads for the level of output chosen. These expenditures are classified as fixed and variable. Thus, the overhead expense standards are set by computing the optimum level of output for a production departments followed by budgets for fixed and variable overheads. If production is seasonal or it fluctuates during the year, a flexible budget may be prepared to facilitate comparison between the set target and actual expenditure for the period.



13.5 TYPES OF VARIANCES

Controllable and un-controllable variances: For effective cost control it is necessary to investigate into the reasons for cost variances and to take corrective actions. For this purpose variances are classified as controllable and uncontrollable variances. **Controllable variances are those which can be controlled under the**

normal operating conditions if a responsibility centre takes preventive measures and acts prudently. **Uncontrollable variances are those which occurs due to conditions which are beyond the control** of a responsibility centre and cannot be controlled even though all preventive measures are in place. Responsibility centres are answerable for all adverse variances which could have been controlled. Controllability is a subjective matter and varies from situation to situation. If the uncontrollable variances are of significant nature and are persistent, the standard may need revision.

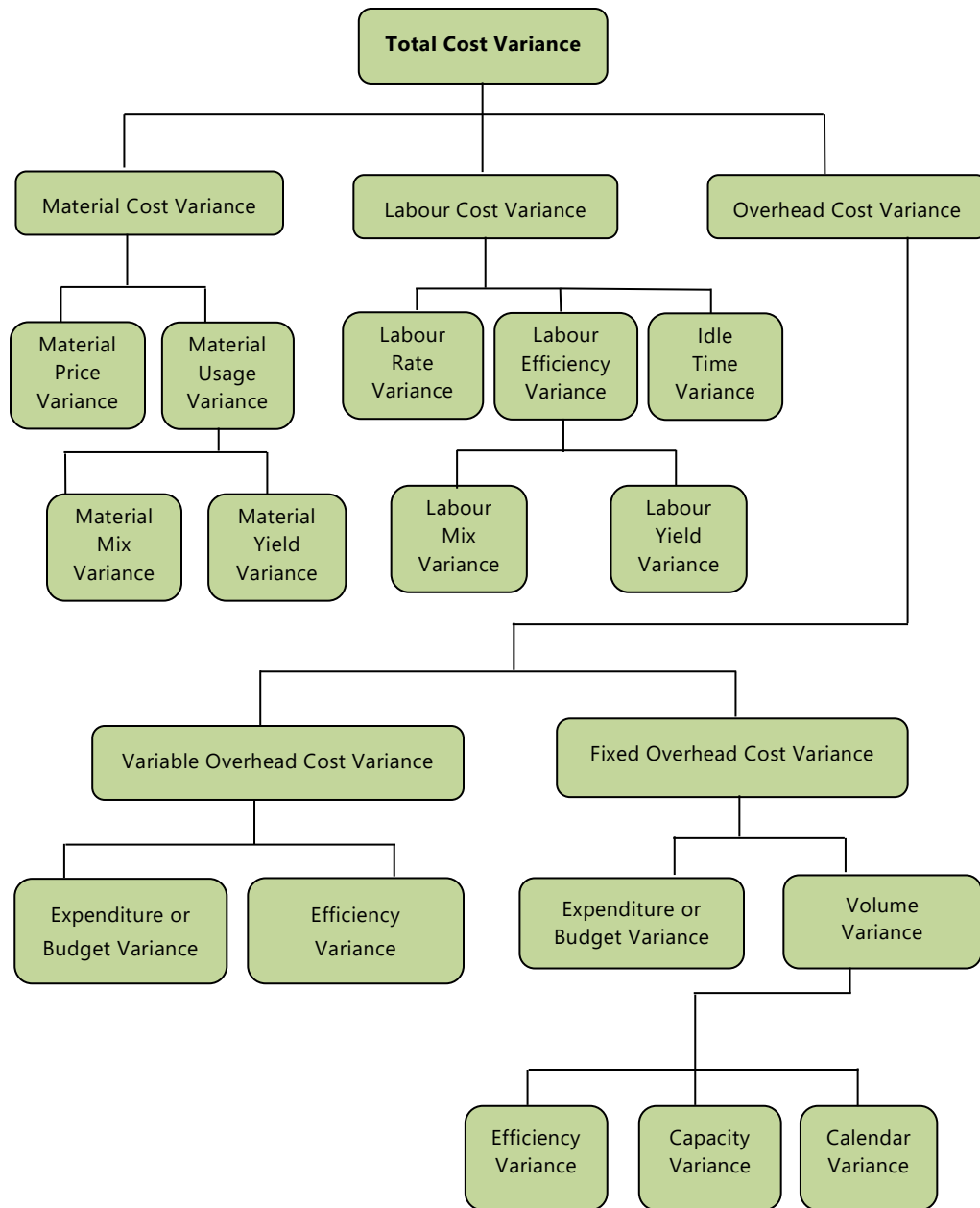
Favourable and Adverse variance: Favourable variances are those which are profitable for the company and adverse variances are those which causes loss to the company. While computing cost variances favourable variance means actual cost is less than standard cost. On the other hand, adverse variance means actual cost is exceeding standard cost. The situation will be reversed for sales variance. Favourable variances mean actual is more than budgeted and adverse when actual is less than budgeted. Favourable variance in short denoted by capital 'F' and adverse variances by capital 'A'.

Students may note that signs of favourable and adverse variance may or may not match exactly with mathematical signs i.e. (+) or (-).



13.6 CLASSIFICATION OF VARIANCES

Variances are broadly classified into two parts namely Revenue variance and Cost variance. At Revenue side variances is calculated by comparing actual sales from budgeted (standard) sales. On the other hand, Cost side reflects variances in cost components. Cost variance classification is shown below with the help of a structured diagram.

**Fig 13.1. Classification of Variances**



13.7 COMPUTATION OF VARIANCES

As discussed earlier variances are classified into two parts. Here we will start from cost side and discuss all cost components one by one with the help of appropriate example and illustrations.

13.7.1 Material Cost Variance

Material cost variance is the **difference between standard cost of materials used and the actual cost of materials**. Mathematically it is written as.

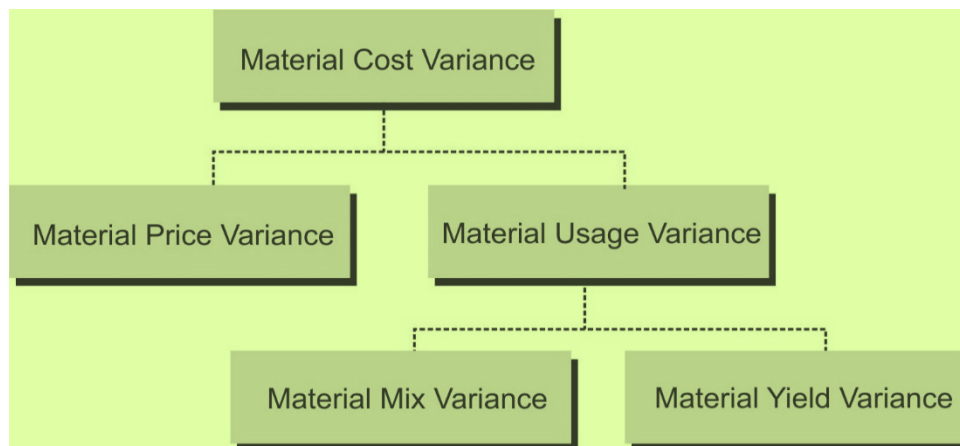
$$\text{Material Cost Variance} = [\text{Standard Cost} - \text{Actual Cost}]$$

Or

$$[(\text{Std. Quantity} \times \text{Std. Price}) - (\text{Actual Quantity} \times \text{Actual Price})]$$

(The difference between the Standard Material Cost of the actual production volume and the Actual Cost of Material)

Reasons for variance: Material cost variance arises mainly because of either difference in material price from the standard price or difference in material consumption from standard consumption or both the reasons. Analysis of material cost variance is done dividing it into two parts namely Material Price variance and Material Usage variance.



(A) Material Price Variance

It measures variance arises in the material cost due to **difference in actual material purchase price from standard material price**. Mathematically it is written as:

Material Price Variance = [Standard Cost of Actual Quantity* – Actual Cost]

Or

Actual Quantity (AQ) × {Std. Price (SP) – Actual Price(A)}

Or

[(SP × AQ) – (AP × AQ)]

(The difference between the Standard Price and Actual Price for the Actual Quantity Purchased)

*Here actual quantity means actual quantity of material purchased. If in the question material purchase is not given, it is taken as equal to material consumed.

Explanation: Material price variance can also be calculated taking material used as actual quantity instead of material purchased. This method is also correct but does not serve the purpose of variance computation. Material price variance may arise from variety of reasons out of which some may be controllable and some may be beyond the control of the purchase department. If price variance arises due to inefficiency of purchase department or any other reason within the control of the company, then it is very important to report variance as early as possible and this can be done by taking purchase quantity as actual quantity for price variance computation.

Responsibility for Material Price Variance: Generally, purchase department purchases materials from the market. Purchase department is expected to perform its function very prudently so that company never suffers loss due to its inefficiency. Purchase department is held responsible for adverse price variance arises due to the factors controllable by the department.

(B) Material Usage Variance

It measures variance in material cost due to usage/ consumption of materials. It is computed as below:

Material Usage Variance = [Standard Cost of Standard Quantity for Actual Production – Standard Cost of Actual Quantity*]

Or

Std. Price (SP) × {Std. Quantity (SQ) – Actual Quantity (AQ)}

Or

[(SQ × SP) – (AQ × SP)]

(The difference between the Standard Quantity specified for actual production and the Actual Quantity used, at Standard Price)

*Here actual quantity means actual quantity of material used.

Responsibility for material usage variance: Material usage is the responsibility of production department and it is held responsible for adverse usage variance.

Reasons for variance: Actual material consumption may differ from the standard quantity either due to difference in proportion used from standard proportion or due to difference in actual yield from standard yield.

Material usage variance is divided into two parts (a) Material usage mix variance and (b) Material yield variance.

(a) Material Mix Variance

Variance in material consumption may arise due to **difference in proportion actually used from the standard mix/ proportion**. It only arises when two or more inputs are used to produce a product. Mathematically,

Material Mix Variance = [Standard Cost of Actual Quantity in Standard Proportion – Standard Cost of Actual Quantity]

Or

Std. Price (SP) × {Revised Std. Quantity (RSQ) – Actual Quantity (AQ)}

Or

[(RSQ × SP) – (AQ × SP)]

(The difference between the Actual Quantity in standard proportion and Actual Quantity in actual proportion, at Standard Price)

(b) Material Yield Variance (Material Sub-usage Variance)

Variance in material consumption which arises due to yield or productivity of the inputs. It may arise due to use of sub- standard quality of materials, inefficiency of workers or due to wrong processing.

Material Yield Variance = [Standard Cost of Standard Quantity for Actual Production – Standard Cost of Actual Quantity in standard proportion]

Or

Std. Price (SP) × {Std. Quantity (SQ) – Revised Standard Quantity (RSQ)}

Or

$$[(SQ \times SP) - (RSQ \times SP)]$$

(The difference between the Standard Quantity specified for actual production and Actual Quantity in standard proportion, at Standard Purchase Price)

Verification of the formulae:

Material Cost Variance = Material Usage Variance + Material Price Variance*

Or, Material Cost Variance = (Material Mix Variance + Material Revised usage Variance) + Material price variance

*If material purchased quantity and material consumed quantity is same

Meaning of the terms used in the formulae:

Term	Meaning
Standard Quantity (SQ)	Quantity of <u>inputs</u> to be used to produce actual <u>output</u> .
Actual Quantity (AQ)	Quantity of <u>inputs</u> actually used to produce actual <u>output</u> .
Revised Standard Quantity (RSQ)	If <u>Actual total quantity</u> of <u>inputs</u> were used in standard proportion.

ILLUSTRATION 1

The standard and actual figures of product 'Z' are as under:

	Standard	Actual
Material quantity	50 units	45 units
Material price per unit	₹ 1.00	₹ 0.80

CALCULATE material cost variances.

SOLUTION

The variances may be calculated as under:

- (a) Standard cost = Std. Qty × Std. price = 50 units × ₹1.00 = ₹50
- (b) Actual cost = Actual qty. × Actual price = 45 units × ₹0.80 = ₹ 36

Variances:

- (i) Price variance = Actual qty (Std. price – Actual price)
 = 45 units (₹1.00 – ₹0.80) = ₹ 9 (F)
- (ii) Usage variance = Std. price (Std. qty – Actual qty.)
 = ₹1 (50 units – 45 units) = ₹ 5 (F)
- (iii) Material cost variance = Standard cost – Actual cost
 (Total variance) = ₹ 50 – ₹ 36 = ₹ 14 (F)

ILLUSTRATION 2

NXE Manufacturing Concern furnishes the following information:

<i>Standard:</i>	<i>Material for 70 kg finished products</i>	<i>100 kg</i>
	<i>Price of material</i>	<i>₹ 1 per kg</i>
<i>Actual:</i>	<i>Output</i>	<i>2,10,000 kg</i>
	<i>Material used</i>	<i>2,80,000 kg</i>
	<i>Cost of Materials</i>	<i>₹ 2,52,000</i>

CALCULATE: (a) Material usage variance, (b) Material price variance, (c) Material cost variance.

SOLUTION

$$\begin{aligned}\text{Standard Quantity of input for actual output (SQ)} &= 2,10,000 \text{ kg} \times \frac{100 \text{ kg}}{70 \text{ kg}} \\ &= 3,00,000 \text{ kg.}\end{aligned}$$

$$\text{Actual Price (AP)} = (\text{₹}2,52,000 \div 2,80,000 \text{ kg}) = \text{₹}0.90 \text{ per kg.}$$

$$\begin{aligned}\text{(a) Material Usage Variance} &= (\text{SQ} - \text{AQ}) \times \text{SP} \\ &= (3,00,000 - 2,80,000) \times 1 = \text{₹ } 20,000 \text{ (F)}\end{aligned}$$

$$\begin{aligned}\text{(b) Material Price Variance} &= (\text{SP} - \text{AP}) \times \text{AQ} \\ &= (1 - 0.90) \times 2,80,000 = \text{₹ } 28,000 \text{ (F)}\end{aligned}$$

$$\begin{aligned}\text{(c) Material Cost Variance} &= (\text{SQ} \times \text{SP}) - (\text{AQ} \times \text{AP}) \\ &= (3,00,000 \times 1) - (2,80,000 \times 0.90) = \text{₹ } 48,000 \text{ (F)}\end{aligned}$$

$$\begin{aligned}\text{Check MCV} &= \text{MPV} + \text{MUV} \\ \text{₹ } 48,000 \text{ (F)} &= \text{₹ } 28,000 \text{ (F)} + \text{₹ } 20,000 \text{ (F)}\end{aligned}$$

ILLUSTRATION 3

The standard cost of a chemical mixture is as follows:

40% material A at ₹ 20 per kg

60% material B at ₹ 30 per kg

A standard loss of 10% of input is expected in production. The cost records for a period showed the following usage:

90 kg material A at a cost of ₹ 18 per kg

110 kg material B at a cost of ₹ 34 per kg

The quantity produced was 182 kg of good product.

CALCULATE (a) Material cost variance, (b) Material price variance, (c) Material usage variance.

SOLUTION**Basic Calculation**

Material	Standard for 180 kg. output			Actual for 182 kg. output		
	Qty. Kg.	Rate (₹)	Amount (₹)	Qty. Kg.	Rate (₹)	Amount (₹)
A	80	20	1,600	90	18	1,620
B	<u>120</u>	30	<u>3,600</u>	<u>110</u>	34	<u>3,740</u>
Total	200		5,200	200		5,360
Less: Loss	20	—	—	18	—	—
	180		5,200	182		5,360

$$\text{Std. cost of actual output} = ₹5,200 \times \frac{182}{180} = ₹ 5,257.78$$

Calculation of Variances

- Material Cost Variance = (Std. cost of actual output – Actual cost)
= (5,257.78 – 5,360) = ₹ 102.22 (A)
- Material Price Variance = (SP – AP) × AQ

Material A	= (20 – 18) × 90	= ₹ 180.00 (F)
Material B	= (30 – 34) × 110	= ₹ 440.00 (A)
MPV		= ₹ 260.00 (A)

3. Material Usage Variance = (Std. Quantity for actual output – Actual Quantity) × Std. Price

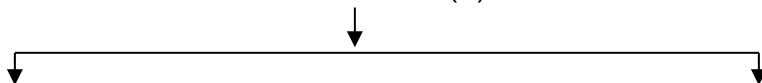
$$\text{Material A} = \left(80 \times \frac{182}{180} - 90 \right) \times 20 = ₹ 182.22 \text{ (A)}$$

$$\text{Material B} = \left(120 \times \frac{182}{180} - 110 \right) \times 30 = ₹ 340.00 \text{ (F)}$$

$$\text{MUV} = ₹ 157.78 \text{ (F)}$$

Check

MCV ₹102.22 (A)



MPV ₹260 (A)

MUV ₹157.78 (F)

ILLUSTRATION 4

ABC Ltd. produces an article by lending two basic raw materials. It operates a standard costing system and the following standards have been set for raw materials:

Material	Standard mix	Standard price (₹ per kg)
A	40%	4
B	60%	3

The standard loss in processing is 15%. During April 2021, the company produced 1,700 kgs. of finished output.

The position of stock and purchases for the month of April 2021 are as under:

Material	Stock on 01.04.2021	Stock on 30.04.2021	Purchased during April 2021	
	(Kg.)	(Kg.)	(Kg.)	(₹)
A	35	5	800	3,400
B	40	50	1,200	3,000

Opening stock of material is valued at standard price.

CALCULATE the following variances:

- Material price variance
- Material usage variance

- (iii) *Material yield variance*
- (iv) *Material mix variance*
- (v) *Total Material cost variance*

SOLUTION

Types of material	Standard			Actual		
	Qty. (Kg.)	Rate (₹)	Amount (₹)	Qty. (Kg.)	Rate (₹)	Amount (₹)
A	800	4	3,200	35	4	140.00
				795	4.25	3,378.75
B	1200	3	3,600	40	3	120.00
				1,150	2.50	2,875.00
Total	2,000		6,800	2,020		6,513.75

(i) Material price variance

= Actual qty. (Std. price – Actual price)

Material A: Since the actual price and standard price in respect of 35 kg. of raw materials A are same i.e. ₹ 4, there will be no price variance in respect of this quantity. Price variance will be in respect of only 795 kg. as given below:

= 795 kg. (₹ 4 – ₹ 4.25) = ₹ 198.75 (A)

Material B: For Material B also, price variance will only be in respect of 1,150 kg. as given below:

= 1,150 kg. (₹ 3 – ₹ 2.50) = ₹ 575 (F)

Total = ₹ 198.75 (A) + 575 (F) = ₹ 376.25(F)

(ii) Material usage variance

= (Std. qty. for actual output – Actual qty.) × Std. price

Material A = (800 – 830) × 4 = 120 (A)

Material B = (1,200 – 1,190) × 3 = 30 (F)

₹ 90 (A)

(iii) Material yield variance

= (Std. qty. - Revised Std. qty.) × Std. Price

$$\text{Material A} = (800 - 808) \times 4 = 32 \text{ (A)}$$

$$\text{Material B} = (1,200 - 1,212) \times 3 = 36 \text{ (A)}$$

$$\underline{\underline{\text{₹ 68 (A)}}}$$

Check

$$\text{MUV} = \text{MMV} + \text{MYV}$$

$$90 \text{ (A)} = 22 \text{ (A)} + 68 \text{ (A)}$$

(iv) Material mix variance

$$= (\text{Revised std. qty.} - \text{Actual qty.}) \times \text{Std. Price}$$

$$\text{Material A} = (808 - 830) \times 4 = 88 \text{ (A)}$$

$$\text{Material B} = (1,212 - 1,190) \times 3 = 66 \text{ (F)}$$

$$\underline{\underline{\text{₹ 22 (A)}}}$$

(v) Total material cost variance

$$= \text{Std. cost for actual output} - \text{Actual cost} = 6,800 - 6,513.75 = 286.25 \text{ (F)}$$

Check

$$\text{MCV} = \text{MPV} + \text{MUV}$$

$$286.25 \text{ (F)} = 376.25 \text{ (F)} + 90 \text{ (A)}$$

Working Notes:

1. Standard quantity for actual output

The standard loss being 15%. It means to produce, 1,700 kg. of the article, standard quantity of material required is:

$$= \frac{100}{85} \times 1,700 \text{ kgs.} = 2,000 \text{ kg.}$$

Out of 2,000 kg. of material used, 40% is of type A and 60% is of type B, i.e., Standard quantity for actual output for:

$$\text{Material A} = 2,000 \times \frac{40}{100} = 800 \text{ kg.}$$

$$\text{Material B} = 2,000 \times \frac{60}{100} = 1,200 \text{ kg.}$$

2. Actual quantity of material

= Opening stock + Purchases – Closing stock

Material A = 35 + 800 – 5 = 830 kg.

Material B = 40 + 1,200 – 50 = 1,190 kg.

3. Standard cost per unit

$$= \frac{\text{Total standard cost}}{\text{Total standard output of std. mix}}$$

$$= \frac{\text{₹ 6,800}}{1,700 \text{ kg.}} = \text{₹ 4 per kg.}$$

4. Revised Standard Quantity

$$\text{Material A} = \frac{2,020}{2,000} \times 800 = 808 \text{ kg.}$$

$$\text{Material B} = \frac{2,020}{2,000} \times 1,200 = 1,212 \text{ kg.}$$

13.7.2 Labour Cost Variance

Amount paid to employees for their labour is generally known as employee or labour cost. In this chapter labour cost is used to denote employees cost. Labour (employee) cost variance is **the difference between actual labour cost and standard cost**. Mathematically it can be written as:

$$\text{Labour Cost Variance} = [\text{Standard Cost} - \text{Actual Cost}]$$

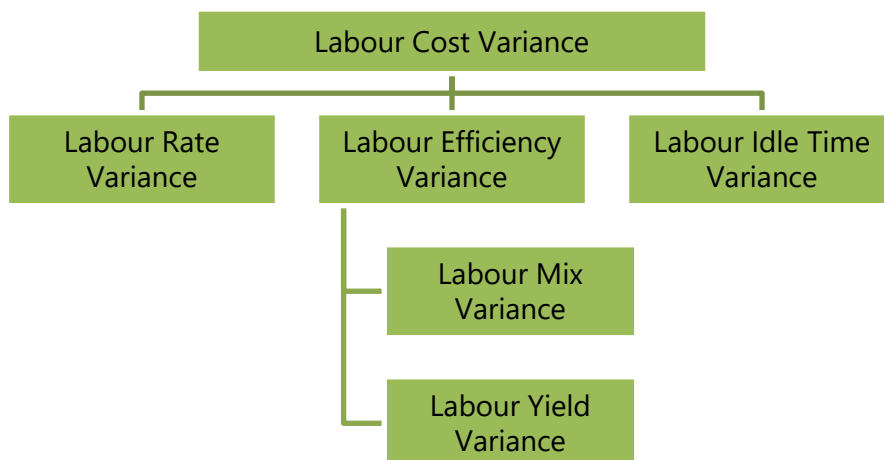
Or

$$[(SH \times SR) - (AH \times AR)]$$

(The difference between the Standard Labour Cost and the Actual Labour Cost incurred for the production achieved)

* Actual hours paid.

Reasons for variance: Difference in labour cost arises either due to difference in the actual labour rate from the standard rate or difference in numbers of hours worked from standard hours. Labour cost variance can be divided into three parts namely (i) Labour Rate Variance (ii) Labour Efficiency Variance and (iii) Labour Idle time Variance.



(A) Labour Rate Variance:

Labour rate variance arises due to **difference in actual rate paid from standard rate**. It is very similar to material price variance. It is calculated as below:

$$\text{Labour Rate Variance} = [\text{Standard Cost of Actual Time} - \text{Actual Cost}]$$

Or

$$\text{Actual Hours (AH*)} \times \{\text{Std. Rate (SR)} - \text{Actual Rate (AR)}\}$$

Or

$$[(\text{SR} \times \text{AH*}) - (\text{AR} \times \text{AH*})]$$

(The difference between the Standard Rate per hour and Actual Rate per hour for the Actual Hours paid)

* Actual hours paid.

Responsibility for labour rate variance: Generally labour rates are influenced by the external factors which are beyond the control of the organisation. However, personnel manager is responsible for labour rate negotiation.

(B) Labour Efficiency Variance:

Labour efficiency variance arises due to deviation in the working hours from the standard working hours.

$$\text{Labour Efficiency Variance} =$$

$$[\text{Standard Cost of Standard Time for Actual Production} - \text{Standard Cost of Actual Time}]$$

Or

$$\text{Std. Rate (SR)} \times \{\text{Std. Hours (SH)} - \text{Actual Hours (AH*)}\}$$

Or

$$[(\text{SH} \times \text{SR}) - (\text{AH}^{\#} \times \text{SR})]$$

(The difference between the Standard Hours specified for actual production and Actual Hours worked at Standard Rate).

Actual Hours worked

Responsibility for labour efficiency variance: Efficiency variance may arise due to ability of the workers, inappropriate team of workers, inefficiency of production manager or foreman etc. However, production manager or foreman can be held responsible for the adverse variance which otherwise can be controlled.

Labour efficiency variance is further divided into the following variances:

- (a) Labour Mix Variance or Gang variance
- (b) Labour Yield Variance (or Labour Revised-efficiency Variance)

(a) Labour Mix Variance:

Labour efficiency **variance which arises due to change in the mix or combination of different skill set** i.e. number of skilled workers, semi-skilled workers and un-skilled workers. Mathematically,

Labour Mix Variance Or Gang Variance =

[Standard Cost of Actual Time *Worked* in Standard Proportion – Standard Cost of Actual Time *Worked*]

Or

$$\text{Std. Rate (SR)} \times \{\text{Revised Std. Hours (RSH)} - \text{Actual Hours}_{\text{Worked}} (\text{AH})\}$$

Or

$$[(\text{RSH} \times \text{SR}) - (\text{AH}^{\#} \times \text{SR})]$$

(The difference between the Actual Hours worked in standard proportion and Actual Hours worked in actual proportion, at Standard Rate).

Actual Hours worked

(b) Labour Yield Variance:

Labour efficiency variance **which arises due to productivity of workers.**

Labour Yield Variance Or Sub-Efficiency Variance =

[Standard Cost of Standard Time for Actual Production – Standard Cost of Actual Time *Worked* in Standard Proportion]

Or

Std. Rate (SR) × {Std. Hours (SH) – Revised Std. Hours (RSH)}

Or

[(SH × SR) – (RSH × SR)]

(The difference between the Standard Hours specified for actual production and Actual Hours worked in standard proportion, at Standard Rate).

(C) Idle Time Variance:

It is calculated for the idle hours. It is difference between paid and worked hours. It is calculated as below:

Labour Idle Time Variance = [Standard Rate per Hour × Actual Idle Hours]

Or

Std. Rate (SR) {Actual Hours_{Paid} – Actual Hours_{Worked}}

Or

[(AH* × SR) – (AH# × SR)]

(The difference between the Actual Hours paid and Actual Hours worked at Standard Rate)

* Actual hours paid; # Actual Hours worked

Verification of formulae:

Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance (if hours paid and hours worked is same)

OR

Labour Cost Variance = Labour Rate Variance + Idle Time Variance + Labour Efficiency Variance

OR

Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance

ILLUSTRATION 5

The standard and actual figures of a firm are as under

Standard time for the job	1,000 hours
Standard rate per hour	₹ 50
Actual time taken	900 hours
Actual wages paid	₹ 36,000

CALCULATE variances.

SOLUTION

- | | | |
|-----|--|--------|
| (a) | Std. labour cost | (₹) |
| | (1,000 hours × ₹50) | 50,000 |
| (b) | Actual wages paid | 36,000 |
| (c) | Actual rate per hour: ₹ 36,000/900 hours = ₹40 | |

Variances

- | | | |
|-------|----------------------------|---|
| (i) | Labour Rate variance | = Actual time (Std. rate – Actual rate) |
| | | = 900 hours (₹50 – ₹40) = ₹9,000 (F) |
| (ii) | Efficiency variance | = Std. rate per hr. (Std. time – Actual time) |
| | | = ₹50 (1,000 hrs. – 900 hrs.) = ₹5,000 (F) |
| (iii) | Total labour cost variance | = Std. labour cost – Actual labour cost |
| | | = {(₹50 × 1,000 hours) – ₹36,000} |
| | | = (₹50,000 – ₹36,000) = ₹14,000 (F) |

ILLUSTRATION 6

The standard output of product 'EXE' is 25 units per hour in manufacturing department of a company employing 100 workers. The standard wage rate per labour hour is ₹ 6.

In a 42 hours week, the department produced 1,040 units of 'EXE' despite 5% of the time paid being lost due to an abnormal reason. The hourly wages actually paid were ₹ 6.20, ₹ 6 and ₹ 5.70 respectively to 10, 30 and 60 of the workers.

CALCULATE relevant labour variances.

SOLUTION**Working Notes:****1. Calculation of standard man hours**

When 100 worker works for 1 hr., then the std. output is 25 units.

$$\text{Std. man hour per unit} = \frac{100 \text{ hrs.}}{25 \text{ units}} = 4 \text{ hrs.}$$

2. Calculation of std. man hours for actual output

Total std. man hours = 1,040 units × 4 hrs. = 4,160 hrs.

Standard for actual			Actual					
Hours	Rate (₹)	Amount (₹)	No. of workers	Actual hours paid	Idle time hrs.	Production hours	Rate (₹)	Amount paid (₹)
4,160	6	24,960	10	420	21	399	6.20	2,604
			30	1,260	63	1,197	6.00	7,560
			60	2,520	126	2,394	5.70	14,364
4,160	6	24,960	100	4,200	210	3,990		24,528

1. Labour cost variance

= Std. labour cost – Actual labour cost

$$= 24,960 - 24,528 = ₹ 432 \text{ (F)}$$

2. Labour rate variance

$$= (SR - AR) \times AH_{\text{Paid}}$$

$$= (6 - 6.20) \times 420 = 84 \text{ (A)}$$

$$= (6 - 6) \times 1260 = \text{NIL}$$

$$= (6 - 5.70) \times 2,520 = 756 \text{ (F)}$$

$$= 672 \text{ (F)}$$

3. Labour efficiency variance

$$= (SH - AH) \times SR$$

$$= (4,160 - 3,990) \times 6 = 1,020 \text{ (F)}$$

4. Labour Idle time variance

$$= \text{Idle Hours} \times \text{SR}$$

$$= 210 \times 6 = 1,260 \text{ (A)}$$

ILLUSTRATION 7

NPX Ltd. uses standard costing system for manufacturing of its product X. Following is the budget data given in relation to labour hours for manufacture of 1 unit of Product X :

Labour	Hours	Rate (₹)
Skilled	2	6
Semi-Skilled	3	4
Un- Skilled	5	3
Total	10	

In the month of January, total 10,000 units were produced following are the details:

Labour	Hours	Rate (₹)	Amount (₹)
Skilled	18,000	7	1,26,000
Semi-Skilled	33,000	3.5	1,15,500
Un- Skilled	58,000	4	2,32,000
Total	1,09,000		4,73,500

Actual Idle hours (abnormal) during the month:

Skilled: 500

Semi- Skilled: 700

Unskilled: 800

Total 2,000

CALCULATE:

- Labour Variances.
- Also show the effect on Labour Rate Variance if 5,000 hours of Skilled Labour are paid @ ₹5.5 per hour and balance were paid @ ₹7 per hour.

SOLUTION

Working Notes:

	Budget			Standard for actual			Actual		
	Hours	Rate (₹)	Amount (₹)	Hours	Rate (₹)	Amount (₹)	Hours	Rate (₹)	Amount (₹)
Skilled	2	6	12	20,000	6	1,20,000	18,000	7	1,26,000
Semi-skilled	3	4	12	30,000	4	1,20,000	33,000	3.5	1,15,500
Unskilled	5	3	15	50,000	3	1,50,000	58,000	4	2,32,000
	10		39	1,00,000		3,90,000	1,09,000		4,73,500

	Idle Hours	Hours worked
Skilled	500	17,500
Semi-skilled	700	32,300
Unskilled	800	57,200
	2,000	1,07,000

(a) (i) Labour Cost Variance = $(SH \times SR - AH \times AR)$

Skilled	$20,000 \times 6 - 18,000 \times 7$	=	₹ 6,000 (A)
Semi-Skilled	$30,000 \times 4 - 33,000 \times 3.5$	=	₹ 4,500 (F)
Unskilled	$50,000 \times 3 - 58,000 \times 4$	=	₹ 82,000 (A)
Total			₹ 83,500 (A)

(ii) Labour Rate Variance = $(SR - AR) \times AH_{\text{Paid}}$

Skilled	$(6 - 7) \times 18,000$	=	₹ 18,000 (A)
Semi-Skilled	$(4 - 3.5) \times 33,000$	=	₹ 16,500 (F)
Unskilled	$(3 - 4) \times 58,000$	=	₹ 58,000 (A)
Total			₹ 59,500 (A)

(iii) Labour Efficiency Variance = $(SH - AH) \times SR$

Skilled	$(20,000 - 17,500) \times 6$	=	₹ 15,000 (F)
Semi-Skilled	$(30,000 - 32,300) \times 4$	=	₹ 9,200 (A)
Unskilled	$(50,000 - 57,200) \times 3$	=	₹ 21,600 (A)
Total			₹ 15,800 (A)

(iv) Labour Idle Time Variance = (Idle Hours × SR)

Skilled	500 × 6	=	₹ 3,000 (A)
Semi- Skilled	700 × 4	=	₹ 2,800 (A)
Unskilled	800 × 3	=	₹ 2,400 (A)
Total			₹ 8,200 (A)

(v) Labour Mix Variance = (RSH – AH_{Worked}) × SR

$$\text{Revised Std. hours (RSH)} = \frac{\text{Std.Hours}}{\text{TotalStd.hours}} \times \text{TotalActual Hours}$$

Skilled	$(\frac{20,000}{1,00,000} \times 1,07,000 - 17,500) \times 6$	=	₹ 23,400 (F)
Semi- Skilled	$(\frac{30,000}{1,00,000} \times 1,07,000 - 32,300) \times 4$	=	₹ 800 (A)
Unskilled	$(\frac{50,000}{1,00,000} \times 1,07,000 - 57,200) \times 3$	=	₹ 11,100 (A)
Total			₹ 11,500 (F)

(vi) Labour Yield Variance = (SH – RSH) × SR

Skilled	$(20,000 - \frac{20,000}{1,00,000} \times 1,07,000) \times 6$	=	₹ 8,400 (A)
Semi- Skilled	$(30,000 - \frac{30,000}{1,00,000} \times 1,07,000) \times 4$	=	₹ 8,400 (A)
Unskilled	$(50,000 - \frac{50,000}{1,00,000} \times 1,07,000) \times 3$	=	₹ 10,500 (A)
Total			₹ 27,300 (A)

(b) Labour Rate Variance = (SR – AR) × AH_{Paid}

Skilled	$(6 - 5.5) \times 5,000$		
	$(6 - 7) \times 13,000$	=	₹ 10,500 (A)
Semi- Skilled	$(4 - 3.5) \times 33,000$	=	₹ 16,500 (F)
Unskilled	$(3 - 4) \times 58,000$	=	₹ 58,000 (A)
Total			₹ 52,000 (A)

ILLUSTRATION 8

The standard labour employment and the actual labour engaged in a week for a job are as under:

	Skilled workers	Semi-skilled workers	Unskilled workers
Standard no. of workers in the gang	32	12	6
Actual no. of workers employed	28	18	4
Standard wage rate per hour	3	2	1
Actual wage rate per hour	4	3	2

During the 40 hours working week, the gang may produce 1,800 labour hours of work. CALCULATE:

- (a) Labour Cost Variance (b) Labour Rate Variance
 (c) Labour Efficiency Variance (d) Labour Mix Variance
 (e) Labour Yield Variance

SOLUTION**Workings:**

1. Standard hours (SH) for actual hours produced are calculated as below:

$$\text{Skilled} = \frac{1,800}{2,000} \times 1,280 = 1,152 \text{ hrs.}$$

$$\text{Semi-skilled} = \frac{1,800}{2,000} \times 480 = 432 \text{ hrs.}$$

$$\text{Unskilled} = \frac{1,800}{2,000} \times 240 = 215 \text{ hrs.}$$

2. Actual hours (AH) paid are calculated as below:

Category	No. of Worker	Hours in a week	Total Hours
Skilled	28	40	1,120
Semi-skilled	18	40	720
Unskilled	4	40	160
			2,000

3. For 40 hours week total Revised standard hours (RSH) will be calculated as below:

Category	No. of Worker	Hours in a week	Total Hours
Skilled	32	40	1,280
Semi-skilled	12	40	480
Unskilled	6	40	240
			2,000

Calculations

Category of workers	SH × SR	AH × SR	AH × AR	RSH × SR
Skilled	$1,152 \times 3 = 3,456$	$1,120 \times 3 = 3,360$	$1,120 \times 4 = 4,480$	$1,280 \times 3 = 3,840$
Semi-skilled	$432 \times 2 = 864$	$720 \times 2 = 1,440$	$720 \times 3 = 2,160$	$480 \times 2 = 960$
Unskilled	$216 \times 1 = 216$	$160 \times 1 = 160$	$160 \times 2 = 320$	$240 \times 1 = 240$
Total	₹ 4,536	₹ 4,960	₹ 6,960	₹ 5,040

- (i) Labour Cost Variance = Std. Cost for hours worked – Actual cost paid
 $= (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR})$
 $= ₹4,536 - 6,960 = ₹2,424 \text{ (A)}$
- (ii) Labour Rate Variance = $\text{AH} (\text{SR} - \text{AR})$ or $(\text{AH} \times \text{SR}) - (\text{AH} \times \text{AR})$
Skilled $= 3,360 - 4,480 = ₹1,120 \text{ (A)}$
Semi-skilled $= 1,440 - 2,160 = ₹720 \text{ (A)}$
Unskilled $= 160 - 320 = ₹160 \text{ (A)}$ 2,000 (A)
- (iii) Labour Efficiency Variance = $\text{SR} (\text{SH} - \text{AH})$ or $(\text{SR} \times \text{SH}) - (\text{SR} \times \text{AH})$
Skilled $= 3,456 - 3,360 = ₹96 \text{ (F)}$
Semi-skilled $= 864 - 1,440 = ₹576 \text{ (A)}$
Unskilled $= 216 - 160 = ₹56 \text{ (F)}$ ₹424 (A)

(iv) Labour Mix Variance = $SR (RSH - AH)$ or $(SR \times RSH) - (SR \times AH)$

Skilled = $3,840 - 3,360 = ₹480 (F)$

Semi-skilled = $960 - 1,440 = ₹480 (A)$

Unskilled = $240 - 160 = ₹80 (F)$ ₹80 (F)

(v) Labour Yield Variance = $SR (SH - RSH)$ or $(SR \times SH) - (SR \times RSH)$

Skilled = $3,456 - 3,840 = ₹384 (A)$

Semi-skilled = $864 - 960 = ₹96 (A)$

Unskilled = $216 - 240 = ₹24 (A)$ ₹504 (A)

Check

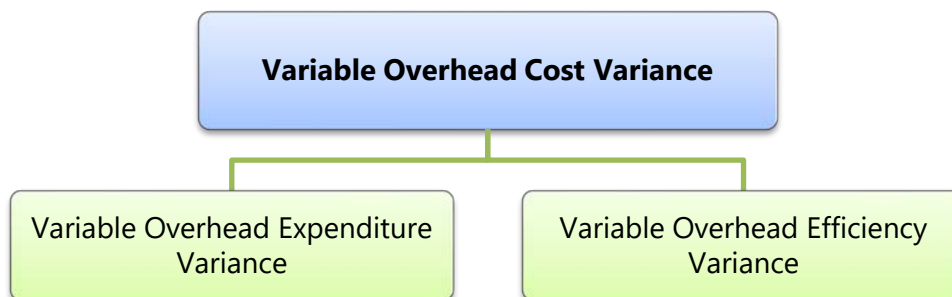
(i) LCV = LRV + LEV

₹2,424 (A) = ₹2,000 (A) + ₹424 (A)

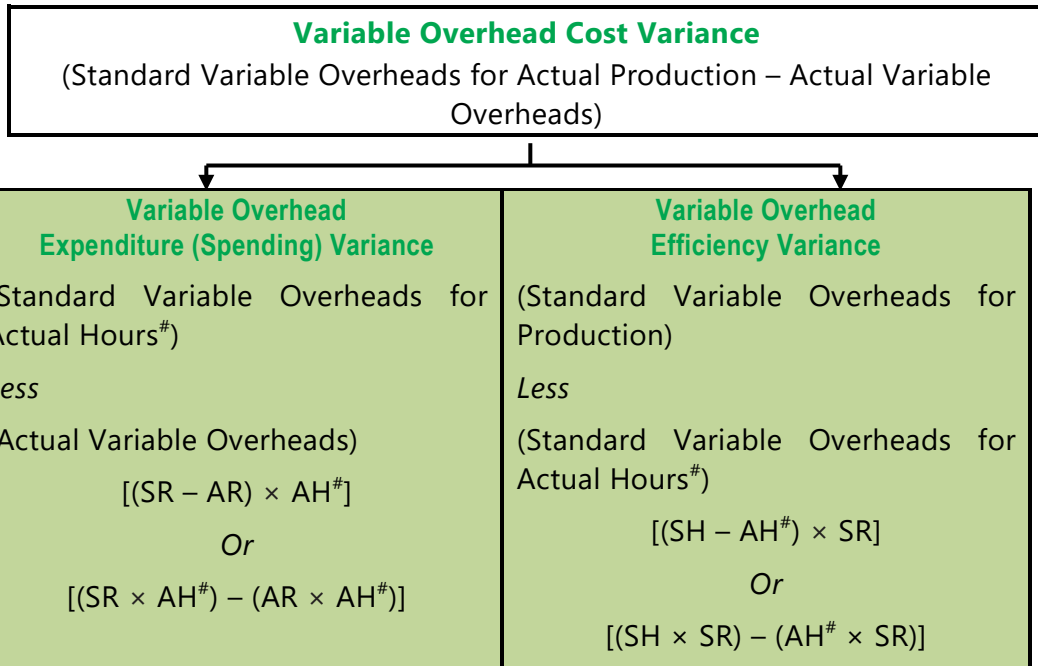
(ii) LEV = LMV + LYV

₹424 (A) = ₹80 (F) + ₹504 (A)

13.7.3 Variable Overheads Cost Variance



Variable overheads consist of expenses other than direct material and direct labour which vary with the level of production. If variable overhead consist of indirect materials, then in this case it varies with the direct material used. On the other hand, if variable overhead is depending on number of hours worked then in this case it will vary with labour hour or machine hours. If nothing is mentioned specifically then we take labour hour as basis. Variable overhead cost variance calculation is similar to labour cost variance. Variable overhead cost variance is divided into two parts (i) Variable Overhead Expenditure Variance and (ii) Variable Overhead Efficiency Variance.



[#] Actual Hours (Worked)

Meaning of the terms used in the formulae:

Term	Meaning
Standard Hours (SH)	Hours required producing actual <u>output</u> .
Actual Hours (AH)	Actual Hours taken to produce actual <u>output</u> .
Revised Standard Hours (RSH)	If actual labour hours worked were worked by standard mix (combination) of labour.
Actual Yield (AY)	Actual Hours worked
Standard Yield (SY)	Actual hours if labour worked in standard ratio
Standard Labour Cost (SLC)	Standard labour cost for actual output

ILLUSTRATION 9

From the following information of G Ltd., CALCULATE (i) Variable Overhead Cost Variance; (ii) Variable Overhead Expenditure Variance and (iii) Variable Overhead Efficiency Variance:

Budgeted production	6,000 units
Budgeted variable overhead	₹ 1,20,000
Standard time for one unit of output	2 hours
Actual production	5,900 units
Actual overhead incurred	₹ 1,22,000
Actual hours worked	11,600 hours

SOLUTION

Workings:

$$1. \quad \text{Standard cost per unit} = \frac{\text{₹}1,20,000}{6,000\text{units}} = \text{₹}20$$

$$2. \quad \text{Standard cost per hour} = \frac{\text{₹}1,20,000}{6,000\text{units} \times 2\text{hours}} = \text{₹}10$$

(i) Variable Overhead Cost Variance:

= Std. Overhead for actual production – Actual overhead incurred

$$= \text{₹}20 \times 5,900 \text{ units} - \text{₹}1,22,000 = \text{₹}4,000 \text{ (A)}$$

(ii) Variable Overhead Expenditure Variance:

= Std. overhead for Actual hours – Actual Overhead

$$= \text{₹}10 \times 11,600 \text{ hours} - \text{₹}1,22,000 = \text{₹}6,000 \text{ (A)}$$

(iii) Variable Overhead Efficiency Variance:

= Std.rate per hour \times (Std. hours for actual production – Actual hours)

$$= \text{₹}10 (2 \text{ hours} \times 5,900 \text{ units} - 11,600 \text{ hours}) = \text{₹}2,000 \text{ (F)}$$

13.7.4 Fixed Overhead Cost Variance

The recovery of the fixed components of the estimated overheads depends upon capacity utilization.

In case a company produces less than the projected utilization it shall not be able to recover all the budgeted fixed overheads. This unrecovered portion is known as production volume variance.

The other variance is because of variations in actual spending when compared with both estimated fixed and estimated variable overheads. Such a variance is known as Overhead expenses variance.

The following detailed discussion shall help you have a clear understanding of these two variances.

(1) Production Volume Variance: The term fixed overheads implies that the element of cost does not vary directly in proportion to the output. In other words, fixed overheads do not change within a given range of activity.

However, the unit cost changes even though the fixed overheads are constant in total within the given range of output. So, higher the level of activity, the lower will be the unit cost or vice versa.

The management is, therefore, faced with a costing difficulty because it requires a representative rate for charging fixed overheads irrespective of changes in volume of output. For example, if the fixed overheads are ₹ 10,000 and the output varies from 8,000 to 11,000 units, the cost per unit of output would be as under:

Fixed Overheads	Output in units	Cost per unit of output (₹)
10,000	8,000	1.25
10,000	9,000	1.11
10,000	10,000	1.00
10,000	11,000	0.91

We have, however, seen that in standard costing, a predetermined rate of overhead recovery is established for costing purposes. This involves the establishment of a predetermined capacity.

If we take, for example; 10,000 units as predetermine volume/capacity, the pre-determined rate will be ₹1 per unit. If the factory produces only 8,000 units, there will be a loss due to under-recovery which can be explained in two-ways:

- (a) The actual cost will be $\text{₹}10,000 \div 8,000 \text{ units} = \text{₹}1.25$ per unit whereas the absorbed cost is ₹1 per unit. Since the cost is more by ₹0.25 per unit, the total loss is $8,000 \text{ units} \times \text{₹} 0.25$ or ₹ 2,000.
- (b) Since the factory has produced only 8,000 units, the amount of overheads recovered is $8,000 \text{ units} \times \text{₹}1$ or ₹ 8,000. Since fixed overheads are constant, the amount which should have been ideally incurred for the department is ₹10,000. Hence there is a difference of ₹2,000 between the overheads recovered and the overheads estimated. This variance is known as production volume variance.

This shows the cost of failure on the part of the factory to produce at the planned activity of 10,000 units. If the company produces 11,000 units, the variance will show the benefits of operating at a level above the budgeted activity. If, however, the factory has produced 10,000 units, there will be no production volume variance because the actual activity equals what was budgeted i.e. the production of 10,000 units.

(2) Overhead Expenses Variance: As discussed above, the Production Volume Variance analyses the unrecovered fixed overheads. Apart from this, there can be variations in the actual spending of both fixed and variable overheads when compared to what was established as a standard. Such variations can be accounted for by analyzing an overhead expenses variance.

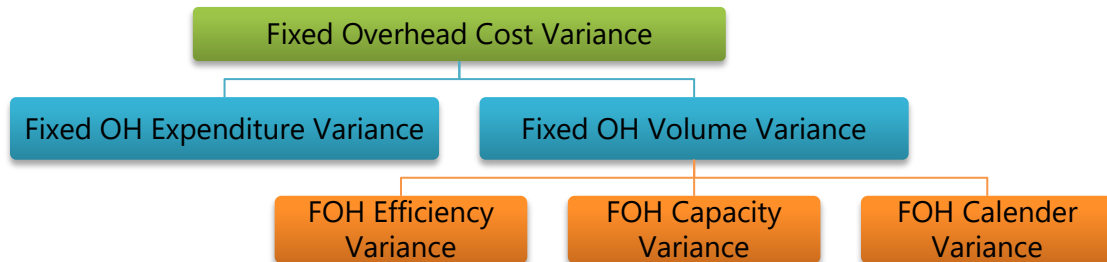
The analysis of overhead variances is different from that of material and labour variances. As overhead is the aggregate of indirect materials, indirect labour and indirect expenses, this variance is considered to be a difficult part of variance analysis. It is important to understand that overhead variance is nothing but under or over-absorption of overhead.

Fixed Overhead Cost Variance: Fixed overhead cost variance is the **difference between actual fixed overhead and absorbed fixed overhead**. Fixed overhead variance is divided into two parts (A) Fixed Overhead Expenditure Variance and (B) Fixed Overhead Volume Variance.

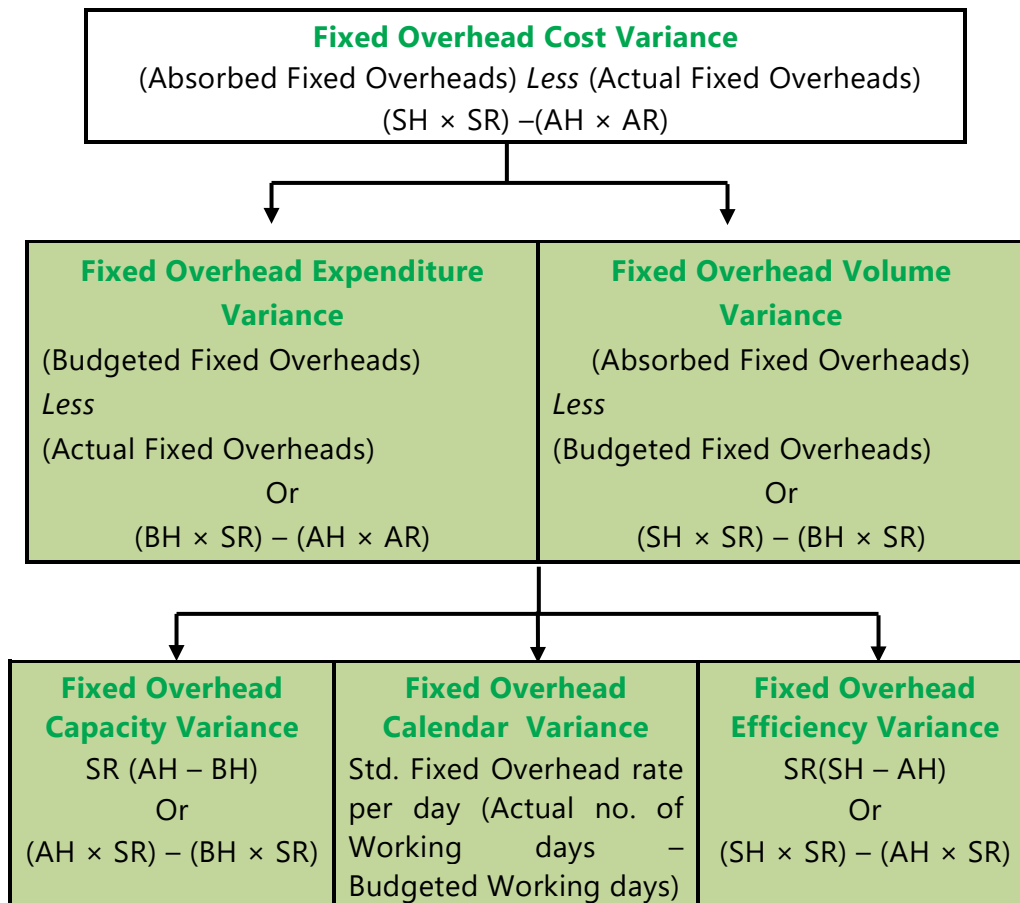
- (A) Fixed Overhead Expenditure Variance:** This is the difference between the actual fixed overhead incurred and budgeted fixed overhead.
- (B) Fixed Overhead Volume Variance:** Variance in fixed overhead which arise due to the volume of production is called fixed overhead volume variance.

Fixed overhead volume variance is further divided into the three variances:

- (a) Efficiency Variance
- (b) Capacity Variance and
- (c) Calendar Variance



Mathematically these can be written as follows:



- (a) **Fixed Overhead Efficiency Variance:** This is the difference between fixed overhead absorbed and standard fixed overhead.
- (b) **Fixed Overhead Capacity Variance:** This is the difference between standard fixed overhead and budgeted overhead.
- (c) **Fixed Overhead Calendar Variance:** This variance arises due to difference in number of actual working days and the standard working days.

Note: When calendar variance is computed, there will be a modification in the capacity variance. In that case revised capacity variance will be calculated and the formula is:

Revised Capacity Variance = (Actual hours – Revised budgeted hours) × Std. fixed rate per hour

Verification of formulae:

F.O. Cost Variance = F.O. Expenditure Variance + F.O. Volume Variance

F.O. Volume Variance = Efficiency Variance + Capacity Variance + Calendar Variance

Basic terms used in the computation of overhead variance

$$\text{Standard overhead rate (per hour)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted hours}}$$

Or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted output in units}}$$

Note: Separate overhead rates will be computed for fixed and variable overheads.

Basic calculations before the computation of overhead variances:

The following basic calculation should be made before computing variances.

- (i) When overhead rate per hour is used:

- (a) Standard hours for actual output (SHAO)

$$\text{SHAO} = \frac{\text{Budgeted Hours}}{\text{Budgeted Output}} \times \text{Actual Output}$$

- (b) Absorbed (or Recovered) overhead = Std. hours for actual output × Std. overhead rate per hour

- (c) Standard overhead = Actual hours × Std. overhead rate per hour
 (d) Budgeted overhead = Budgeted hours × Std. overhead rate per hour
 (e) Actual overhead = Actual hours × Actual overhead rate per hour
 (ii) When overhead rate per unit is used
 (a) Standard output for actual hours (SOAH)

$$\text{SOAH} = \frac{\text{Budgeted Output}}{\text{Budgeted Hours}} \times \text{Actual Hours}$$

- (b) Absorbed overhead = Actual output × Std. overhead rate per unit
 (c) Standard overhead = Std. output for actual time × Std. overhead rate per unit
 (d) Budgeted overhead = Budgeted output × Std. overhead rate per unit
 (e) Actual overhead = Actual output × Actual overhead rate per unit
 (f) Overhead cost variance = Absorbed overhead – Actual overhead
 (g) OCV = (Std. hours for actual output × Std. overhead rate) – Actual overhead

ILLUSTRATION 10

The cost detail of J&G Ltd. for the month of September is as follows:

	Budgeted	Actual
Fixed overhead	₹ 15,00,000	₹ 15,60,000
Units of production	7,500	7,800
Standard time for one unit	2 hours	-
Actual hours worked	-	16,000 hours

Required:

CALCULATE (i) Fixed Overhead Cost Variance (ii) Fixed Overhead Expenditure Variance (iii) Fixed Overhead Volume Variance (iv) Fixed Overhead Efficiency Variance and (v) Fixed Overhead Capacity Variance.

SOLUTION

- (i) Fixed Overhead Cost Variance:
 = Overhead absorbed for actual production – Actual overhead incurred

$$= \left(\frac{₹15,00,000}{7,500} \times 7,800 \right) - ₹15,60,000 = 0$$

(ii) Fixed Overhead Expenditure Variance:

= Budgeted overhead – Actual overhead

= ₹15,00,000 - ₹15,60,000 = ₹60,000 (A)

(iii) Fixed Overhead Volume Variance:

= Absorbed overhead – Budgeted overhead

$$= \left(\frac{₹15,00,000}{7,500} \times 7,800 \right) - ₹15,00,000 = ₹60,000 (F)$$

(iv) Fixed Overhead Efficiency Variance:

= Std. Rate (Std. hours for actual production - Actual hours)

$$= \frac{₹15,00,000}{7,500 \times 2} \times \{(2 \text{ hours} \times 7,800 \text{ hours}) - 16,000 \text{ hours}\}$$

= ₹100 (15,600 - 16,000) = ₹ 40,000 (A)

(v) Fixed Overhead Capacity Variance:

= Std. Rate (Actual hours - Budgeted hours)

$$= \frac{₹15,00,000}{7,500 \times 2} \times (16,000 \text{ hours} - 15,000 \text{ hours})$$

= ₹100 (16,000 - 15,000) = ₹1,00,000 (F)

ILLUSTRATION 11

A company has a normal capacity of 120 machines, working 8 hours per day of 25 days in a month. The fixed overheads are budgeted at ₹ 1,44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In April 2021, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹ 1,42,000.

COMPUTE the following Fixed Overhead variance:

1. Efficiency variance
2. Capacity variance
3. Calendar variance
4. Expenditure variance

5. *Volume variance*
6. *Total Fixed overhead variance*

SOLUTION**Working Notes:**

		Budget	Actual
(1)	Fixed overheads for the month	1,44,000	1,42,000
(2)	Working days per month	25	24
(3)	Working hours per month	(120 machines × 8 hrs. × 25 days) = 24,000	(840 machines hours × 24 days) = 20,160
(4)	Production units per month	$\frac{24,000 \text{ hrs.}}{4 \text{ hrs.}} = 6,000$	5,305

- (5) Standard hours for actual production
 = Actual production units × Std. hours per unit
 = 5,305 × 4 = 21,220 hrs.
- (6) Standard fixed overhead rate per unit = $\frac{₹ 1,44,000}{6000 \text{ units}} = ₹ 24$
- (7) Standard fixed overhead rate per hour = $\frac{₹ 1,44,000}{24,000 \text{ hrs.}} = ₹ 6$
- (8) Standard fixed overhead per day = $\frac{₹ 1,44,000}{25 \text{ days}} = ₹ 5,760$

1. Efficiency variance

= Std. rate per hr. (Std. hrs. for actual production – Actual hrs.)
 = 6 × (21,220 – 20,160) = ₹ 6,360 (F)

2. Capacity variance

= Std. Rate (Actual hours - Budgeted hours)
 = 6 × {20,160 – (24 days × 120 machine × 8 hrs.)} = ₹ 17,280 (A)

3. Calendar variance

= (Actual No. of days – Budgeted No. of days) × Std. rate per day

= (24 – 25) × 5,760 = ₹ 5,760 (A)

4. Expenditure variance

= Budgeted overhead – Actual overhead

= 1,44,000 – 1,42,000 = ₹ 2,000 (F)

5. Volume variance

= Absorbed overhead – Budgeted overhead

= (5,305 × 24) – 1,44,000 = ₹ 16,680 (A)

6. Total fixed overhead Variance

= Absorbed overhead – Actual overhead incurred

= (5,305 × 24) – 1,42,000 = ₹ 14,680 (A)

ILLUSTRATION 12

The overhead expense budget for a factory producing to a capacity of 200 units per month is as follows:

Description of overhead	Fixed cost per unit in ₹	Variable cost per unit in ₹	Total cost per unit in ₹
Power and fuel	1,000	500	1,500
Repair and maintenance	500	250	750
Printing and stationary	500	250	750
Other overheads	1,000	500	1,500
	₹ 3,000	₹ 1,500	4,500

The factory has actually produced only 100 units in a particular month. Details of overheads actually incurred have been provided by the accounts department and are as follows:

Description of overhead	Actual cost
Power and fuel	₹ 4,00,000
Repair and maintenance	₹ 2,00,000
Printing and stationary	₹ 1,75,000
Other overheads	₹ 3,75,000

You are required to CALCULATE the Overhead volume variance and the overhead expense variances.

SOLUTION

Overheads volume variance (in case of fixed overhead):

Standard fixed overheads per unit (SR): ₹3,000 (Given)

Actual production : 100 units

Standard production (capacity) : 200 units

Fixed Overhead Volume Variance:

$$\begin{aligned}
 &= \text{Absorbed overhead} - \text{Budgeted Overhead} \\
 &= (\text{₹}3,000 \times 100 \text{ units}) - (\text{₹}3,000 \times 200 \text{ units}) \\
 &= \text{₹}3,00,000 - \text{₹}6,00,000 = \text{₹}3,00,000 \text{ (Adverse)}
 \end{aligned}$$

Overhead expense variances

For variable overhead:

$$\begin{aligned}
 &= AQ (SR - AR) \\
 &= 100 \text{ units } (\text{₹}1,500 - \text{₹}1,500) = \text{Nil}
 \end{aligned}$$

For fixed overhead:

$$\begin{aligned}
 &= \text{Budgeted Overhead} - \text{Actual Overhead} \\
 &= (\text{₹}3,000 \times 200 \text{ units}) - (\text{Total overhead} - \text{Variable overhead}) \\
 &= (\text{₹}3,000 \times 200 \text{ units}) - (\text{₹}11,50,000 - \text{₹}1,500 \times 100 \text{ units}) \\
 &= \text{₹}6,00,000 - (\text{₹}11,50,000 - \text{₹}1,50,000) \\
 &= \text{₹}6,00,000 - \text{₹}10,00,000 = \text{₹}4,00,000 \text{ (Adverse)}
 \end{aligned}$$

ILLUSTRATION 13

The following information was obtained from the records of a manufacturing unit using standard costing system.

	Standard	Actual
Production	4,000 units	3,800 units
Working days	20	21
Machine hours	8,000 hours	7,800 hours

Fixed Overhead	₹ 4,00,000	₹ 3,90,000
Variable Overhead	₹ 1,20,000	₹ 1,20,000

You are required to CALCULATE the following overhead variance:

- (a) Variable overhead variances
- (b) Fixed overhead variances

SOLUTION

(a) Variable Overhead Variances

- (i) Variable Overhead Variance:

= Std. overhead for actual production – Actual overhead

$$= \left(\frac{₹ 1,20,000}{4,000 \text{ units}} \times 3,800 \text{ units} \right) - ₹ 1,20,000$$

$$= ₹ 1,14,000 - ₹ 1,20,000 = ₹ 6,000 \text{ (A)}$$

- (ii) Variable Overhead Expenditure Variance:

= Std. overhead for actual hours – Actual overhead

$$= \left(\frac{₹ 1,20,000}{8,000 \text{ hours}} \times 7,800 \text{ hours} \right) - ₹ 1,20,000$$

$$= ₹ 15 \times 7,800 \text{ hours} - ₹ 1,20,000 = ₹ 3,000 \text{ (A)}$$

- (iii) Variable Overhead Efficiency Variance:

= Std. Rate per hour (Std. hours for actual production – Actual hours)

$$= \frac{₹ 1,20,000}{8,000 \text{ hours}} \times \left[\left(\frac{8,000 \text{ hours}}{4,000 \text{ units}} \times 3,800 \text{ units} \right) - 7,800 \text{ hours} \right]$$

$$= ₹ 15 \times (7,600 \text{ hours} - 7,800 \text{ hours}) = ₹ 3,000 \text{ (A)}$$

(b) Fixed Overhead Variance:

- (i) Fixed Overhead Variance:

= Absorbed overhead – Actual overhead

$$= \{(SR \times SH) - (AR \times AH)\}$$

$$= \left(\frac{₹ 4,00,000}{4,000 \text{ units}} \times 3,800 \text{ units} \right) - ₹ 3,90,000$$

$$= ₹ 3,80,000 - ₹ 3,90,000 = ₹ 10,000 \text{ (A)}$$

- (ii) Fixed Overhead Expenditure Variance:
 = Budgeted Overhead – Actual Overhead
 = ₹4,00,000 - ₹3,90,000 = ₹10,000 (F)
- (iii) Fixed Overhead Volume Variance:
 = Absorbed overhead – Budgeted Overhead
 = $\left(\frac{₹4,00,000}{4,000 \text{ units}} \times 3,800 \text{ units} \right) - ₹4,00,000$
 = ₹3,80,000 - ₹4,00,000 = ₹20,000 (A)
- (iv) Fixed Overhead Efficiency Variance:
 = SR × (Std. hours for actual production – Actual hours)
 = ₹50 × {(2 hours × 3,800 units) – 7,800 hours}
 = ₹3,80,000 - ₹3,90,000 = ₹10,000 (A)
- (v) Fixed Overhead Capacity Variance:
 = SR × (Actual hours – Revised budgeted hours)
 = ₹50 × $\left[7,800 \text{ hours} - \frac{8,000}{20 \text{ days}} \times 21 \text{ days} \right]$
 = ₹50 × (7,800 hours – 8,400 hours) = ₹30,000 (A)
- (vi) Fixed Overhead Calendar Variance:
 = Rate per day (Budgeted days – Actual days)
 = $\frac{₹4,00,000}{20 \text{ days}} \times (20 \text{ days} - 21 \text{ days}) = 20,000 \text{ (F)}$



13.8 ADVANTAGES AND CRITICISM OF STANDARD COSTING

13.8.1 Advantages of Standard Costing

Following are the advantages of standard costing.

- (i) **It serves as a basis for measuring operating performance and cost control.** It is possible by setting standards, proper classification and

determination of variances. It serves as a signal for prompt corrective action. It helps to report exceptional variances i.e. the only matters which are not proceeding according to plan are reported. This enables the managers to concentrate on essential matters only.

- (ii) **It aids price fixing.** Standard costing can be used to predict costs. Although actual cost may vary from day to day, standard costs will remain stable over a period of time and, where demand for a product is elastic, this information can be used as a basis for fixing the selling price.
- (iii) **Introduction of standard costing facilitates evaluation of jobs and introduction of incentives.** Job values can be determined by the use of evaluation and scale of wages fixed according to the responsibility involved in each job.
- (iv) Standard costing **facilitates the estimation of the cost of new products** with greater accuracy.
- (v) It serves as a **basis for inventory valuation.** Standard costs are used for inventory valuation. A further advantage of this procedure is that material stock can be recorded in terms of quantities only.
- (vi) Standard costing is also **used for the measurement of profit.** The question of correct approach of calculating profit is very much related to methods of stock valuation and absorption of fixed overheads. Standard costing eliminates any variations in profit due to changes in stock values from one period to another thus provides a basis for the measurement of profit.
- (vii) Standard costing is **used in planning, budgeting and decision making.** Standard costs being the pre-determined costs, are particularly useful in planning and budgeting.
- (viii) Standard costing is **used in standardisation of products, operations and processes,** it improves the overall production efficiency and reduces costs.
- (ix) It provides objectives and targets to be achieved by each level of management and defines the responsibilities of departmental managers. Thus, the system **serves as an incentive to the departmental head to achieve the targets set by the company.**
- (x) Standard costing sets a uniform basis for comparison of all elements of costs. Since care is taken in setting standards, the standards become unchanging units of comparison. The standard hour may be used as a basic unit to compare dissimilar products or processes.

- (xi) The maximum use of working capital, plant facilities and current assets is assured because wastage of materials and loss due to idle time are closely controlled.

13.8.2 Criticism of Standard Costing

The following are some of the criticism which may be leveled against the standard costing system. The arguments have been suitably answered as stated against each by advocates of the standard costing and hence they do not invalidate the usefulness of the system to business enterprises.

(i) Variation in price: One of the chief problem faced in the operation of the standard costing system is the precise estimation of likely prices or rate to be paid. The variability of prices is so great that even actual prices are not necessarily adequately representative of cost. But the use of sophisticated forecasting techniques should be able to cover the price fluctuation to some extent. Besides this, the system provides for isolating uncontrollable variances arising from variations to be dealt with separately.

(ii) Varying levels of output: If the standard level of output set for pre-determination of standard costs is not achieved, the standard costs are said to be not realised. However, the statement that the capacity utilisation cannot be precisely estimated for absorption of overheads may be true only in some industries of jobbing type. In vast majority of industries, use of forecasting techniques, market research, etc., help to estimate the output with reasonable accuracy and thus the variation is unlikely to be very large. Prime cost will not be affected by such variation and, moreover, variance analysis helps to measure the effects of idle time.

(iii) Changing standard of technology: In case of industries that have frequent technological changes affecting the conditions of production, standard costing may not be suitable. This criticism does not affect the system of standard costing. Cost reduction and cost control is a cardinal feature of standard costing because standards once set do not always remain stable. They have to be revised.

(iv) Attitude of technical people: Technical people are accustomed to think of standards as physical standards and, therefore, they will be misled by standard costs. Since technical people can be educated to adopt themselves to the system through orientation courses, it is not an insurmountable difficulty.

(v) Mix of products: Standard costing presupposes a pre-determined combination of products both in variety and quantity. The mixture of materials used to manufacture the products may vary in the long run but since standard costs are

set normally for a short period, such changes can be taken care of by revision of standards.

(vi) Level of Performance: Standards may be either too strict or too liberal because they may be based on (a) theoretical maximum efficiency, (b) attainable good performance or (c) average past performance. To overcome this difficulty, the management should give thought to the selection of a suitable type of standard. The type of standard most effective in the control of costs is one which represents an attainable level of good performance.

(vii) Standard costs cannot possibly reflect the true value in exchange. If previous historical costs are amended roughly to arrive at estimates for ad hoc purposes, they are not standard costs in the strict sense of the term and hence they cannot also reflect true value in exchange. In arriving at standard costs, however, the economic and technical factors, internal and external, are brought together and analysed to arrive at quantities and prices which reflect optimum operations. The resulting costs, therefore, become realistic measures of the sacrifices involved.

(viii) Fixation of standards may be costly: It may require high order of skill and competency. Small concerns, therefore, feel difficulty in the operation of such system.

SUMMARY

- ◆ **Standard Costing:** A technique which uses standards for costs and revenues for the purposes of control through variance analysis.
- ◆ **Standard Price:** A predetermined price fixed on the basis of a specification of a product or service and of all factors affecting that price.
- ◆ **Standard Time:** The total time in which task should be completed at standard performance.
- ◆ **Variance:** A divergence from the predetermined rates, expressed ultimately in money value, generally used in standard costing and budgetary control systems.
- ◆ **Variance Analysis:** The analysis of variances arising in standard costing system into their constituent parts.
- ◆ **Revision Variance:** It is the difference between the original standard cost and the revised standard cost of actual production.
- ◆ **Basic Standard:** A standard fixed for a fairly long period.

- ◆ **Current Standard:** A standard fixed for a short period.
- ◆ **Estimated Cost:** An estimate of what the cost is likely to be during a given period of time.
- ◆ **Ideal Cost:** A cost which should be incurred during a period under ideal conditions.

Important Formulas

- ◆ **Material Variance:**

Material Costs Variance = (Std. qty × Std. Price) – (Actual qty × Actual price)

Material Usage Variance = Std. price (Std. Qty. – Actual qty.)

Material Price Variance = Actual qty. (Std. price – Actual price)

Material Cost Variance = Material usage variance + Material price variance

Material Mix Variance = SP (RSQ – AQ)

Material Yield Variance = SP (SQ – RSQ)

- ◆ **Labour Variance:**

Labour Cost Variance = (Std. time × Std. Rate) – (Actual time × Actual rate)

Labour Efficiency Variance = Std. rate (Std. time – Actual time)

Labour Rate Variance = Actual time (Std. rate – Actual rate)

Labour Idle Time Variance = Idle time × Std. rate

Labour Cost Variance = Labour Efficiency Variance + Labour Rate Variance

Labour Mix Variance = SR (RSH – AH)

Labour Yield Variance = SR (SH – RSH)

- ◆ **Fixed Overhead Variances:**

F.O. Cost Variance = Recovered Overhead – Actual Overhead

F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead

F.O. Volume Variance = Recovered Overhead – Budgeted Overhead

F.O. Efficiency Variance = Recovered Overhead – Standard Overhead

F.O. Capacity Variance = Standard Overhead – Budgeted Overhead

F.O. Calendar Variance = SR (Actual no. of working days – Std. no. working days)

♦ **Variable Overhead Variances**

V.O. Cost variance = Recovered Overhead – Actual Overhead

V.O. Expenditure Variance = Standard Overhead – Actual Overhead

V.O. Efficiency Variance = Recovered Overhead – Standard Overhead

TEST YOUR KNOWLEDGE

MCQs based Questions

1. Under standard cost system the cost of the product determined at the beginning of production is its:
 - (a) Direct cost
 - (b) Pre-determined cost
 - (c) Historical cost
 - (d) Actual cost
2. The deviations between actual and standard cost is known as:
 - (a) Multiple analysis
 - (b) Variable cost analysis
 - (c) Variance analysis
 - (d) Linear trend analysis
3. The standard which is attainable under favourable conditions is:
 - (a) Theoretical standard
 - (b) Expected standard
 - (c) Normal standard
 - (d) Basic standard
4. The standard most suitable from cost control point of view is:
 - (a) Normal standard
 - (b) Theoretical standard
 - (c) Expected standard
 - (d) Basic standard

5. Overhead cost variances is:
- (a) The difference between overheads recovered on actual output - actual overhead incurred.
 - (b) The difference between budgeted overhead cost and actual overhead cost.
 - (c) Obtained by multiplying standard overhead absorption rate with the difference between standard hours for actual output and actual hours worked.
 - (d) None of the above
6. Which of the following variance arises when more than one material is used in the manufacture of a product:
- (a) Material price variance
 - (b) Material usage variance
 - (c) Material yield variance
 - (d) Material mix variance
7. If standard hours for 100 units of output are 400 @ ₹ 2 per hour and actual hours taken are 380 @ ₹ 2.25 per hour, then the labour rate variance is:
- (a) ₹ 95 (adverse)
 - (b) ₹ 100 (adverse)
 - (c) ₹ 25 (favourable)
 - (d) ₹ 120 (adverse)
8. Controllable variances are best disposed-off by transferring to:
- (a) Cost of goods sold
 - (b) Cost of goods sold and inventories
 - (c) Inventories of work-in-progress and finished goods
 - (d) Costing profit and loss account
9. Idle time variance is obtained by multiplying:
- (a) The difference between standard and actual hours by the actual rate of labour per hour

- (b) The difference between actual labour hours paid and actual labour hours worked by the standard rate
 - (c) The difference between standard and actual hours by the standard rate of labour per hour
 - (d) None of the above.
10. Basic standards are:
- (a) Those standards, which require high degree of efficiency and performance.
 - (b) Average standards and are useful in long term planning.
 - (c) Standards, which can be attained or achieved
 - (d) Assuming to remain unchanged for a long time.

Theoretical Questions

1. DISCUSS the process of setting standards.
2. DISCUSS the types of standards.
3. HOW material usage standard is set
4. DISCUSS the various types of fixed overhead variances.

Practical Questions

1. For making 10 kg. of CEMCO, the standard material requirements is:

Material	Quantity	Rate per kg. (₹)
A	8 kg	6.00
B	4 kg	4.00

During April, 1,000 kg of CEMCO were produced. The actual consumption of materials is as under:

Material	Quantity (Kg.)	Rate per kg. (₹)
A	750	7.00
B	500	5.00

CALCULATE (a) Material Cost Variance; (b) Material Price Variance; (c) Material usage Variance.

2. The standard mix to produce one unit of a product is as follows:

Material X	60 units @ ₹ 15 per unit	=	900
Material Y	80 units @ ₹ 20 per unit	=	1,600
Material Z	<u>100 units @ ₹ 25 per unit</u>	=	<u>2,500</u>
	<u>240 units</u>		<u>5,000</u>

During the month of April, 10 units were actually produced and consumption was as follows:

Material X	640 units @ ₹ 17.50 per unit	=	11,200
Material Y	950 units @ ₹ 18.00 per unit	=	17,100
Material Z	<u>870 units @ ₹ 27.50 per unit</u>	=	<u>23,925</u>
	<u>2,460 units</u>		<u>52,225</u>

CALCULATE all material variances.

3. GAP Limited operates a system of standard costing in respect of one of its products which is manufactured within a single cost centre. Following are the details.

Budgeted data:

Material	Qty	Price (₹)	Amount (₹)
A	60	20	1200
B	<u>40</u>	30	<u>1200</u>
Inputs	100		2400
Normal loss	<u>20</u>		<u> </u>
Output	<u>80</u>		<u>2400</u>

Actual data:

Actual output 80 units.

Material	Qty	Price (₹)	Amount (₹)
A	70	?	?
B	?	30	?
Material Price Variance (A)		₹ 105A	
Material cost variance		₹ 275A	

You are required to CALCULATE:

- (i) Actual Price of material A
 - (ii) Actual Quantity of material B
 - (iii) Material Price Variance
 - (iv) Material Usage Variance
 - (v) Material Mix Variance
 - (vi) Material Sub Usage Variance
4. One kilogram of product K requires two chemicals A and B. The following were the details of product K for the month of June 2021:
- (a) Standard mix for chemical A is 50% and chemical B is 50%.
 - (b) Standard price kilogram of chemical A is ₹ 12 and chemical B is ₹ 15.
 - (c) Actual input of chemical B is 70 kilograms.
 - (d) Actual price per kilogram of chemical A is ₹ 15
 - (e) Standard normal loss is 10% of total input
 - (f) Total Material cost variance is ₹ 650 adverse.
 - (g) Total Material yield variance is ₹ 135 adverse.

You are required to CALCULATE:

- (i) Total Material mix variance
 - (ii) Total Material usage variance
 - (iii) Total Material price variance
 - (iv) Actual loss of actual input
 - (v) Actual input of chemical A
 - (vi) Actual price per kg. of chemical B
5. The following standards have been set to manufacture a product:

Direct Material:	(₹)
2 units of A @ ₹ 4 per unit	8.00
3 units of B @ ₹ 3 per unit	9.00
15 units of C @ ₹ 1 per unit	<u>15.00</u>

	32.00
Direct Labour: 3 hours @ ₹ 8 per hour	<u>24.00</u>
Total standard prime cost	<u>56.00</u>

The company manufactured and sold 6,000 units of the product during the year. Direct material costs were as follows:

12,500 units of A at ₹ 4.40 per unit

18,000 units of B at ₹ 2.80 per unit

88,500 units of C at ₹ 1.20 per unit

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours, the company paid at ₹ 12 per hour while for the remaining, the wages were paid at standard rate.

CALCULATE

- (i) Materials price variance & Usage variance
- (ii) Labour rate & Efficiency variances.

6. The following information is available from the cost records of Novell & Co. for the month of March 2021:

Materials purchased	20,000 units @ ₹ 88,000
Materials consumed	19,000 units
Actual wages paid for 4,950 hrs.	₹ 24,750
Units produced	1,800 units
Standard rates and pieces are:	
Direct material	₹ 4 per unit
Standard output	10 number for one unit
Direct labour rate	₹ 4.00 per hour
Standard requirement	2.5 hours per unit

You are required to CALCULATE relevant material and labour variance for the month.

7. XYZ Company has established the following standards for factory overheads.

Variable overhead per unit:	₹ 10/-
Fixed overheads per month	₹ 1,00,000

Capacity of the plant 20,000 units per month.

The actual data for the month are as follows:

Actual overheads incurred ₹ 3,00,000

Actual output (units) 15,000 units

Required:

CALCULATE overhead variances viz:

- (i) Production volume variance
- (ii) Overhead expense variance

8. A company has a normal capacity of 120 machines, working 8 hours per day for 25 days in a month. The fixed overheads are budgeted at ₹ 1,44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In the month of April, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹ 1,42,000.

CALCULATE:

- (i) Expense variance
- (ii) Volume variance
- (iii) Total fixed overheads variance.

9. Following information is available from the records of a factory:

	Budget	Actual
Fixed overhead for the month of June	₹ 10,000	₹ 12,000
Production in June (units)	2,000	2,100
Standard time per unit (hours)	10	–
Actual hours worked in June	–	21,000

CALCULATE:

- (i) Fixed overhead cost variance,
- (ii) Expenditure variance,
- (iii) Volume variance.

10. XYZ Ltd. has furnished you the following information for the month of August:

	Budget	Actual
Output (units)	30,000	32,500
Hours	30,000	33,000
Fixed overhead	₹ 45,000	50,000
Variable overhead	₹ 60,000	68,000
Working days	25	26

CALCULATE overhead variances.

11. S.V. Ltd. has furnished the following data:

	Budget	Actual (for the month of July)
No. of working days	25	27
Production in units	20,000	22,000
Fixed overheads	₹ 30,000	₹ 31,000

Budgeted fixed overhead rate is ₹ 1.00 per hour. In July, the actual hours worked were 31,500.

CALCULATE the following variances:

- Volume variance.
 - Expenditure variance.
 - Total overhead variance.
12. The following data for Pijee Ltd. is given:

	Budget	Actual
Production (in units)	400	360
Man hours to produce above	8,000	7,000
Variable overheads (in ₹)	10,000	9,150

The standard time to produce one unit of the product is 20 hours.

CALCULATE relevant Variable overhead variances.

13. The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Output (budgeted) per man-hour (in units)	1
Fixed overhead cost as budgeted	₹ 1,50,000
Actual number of working days	27
Actual man-hours per day	6,300
Actual output per man-hour (in-units)	0.9
Actual fixed overhead incurred	₹ 1,56,000

CALCULATE fixed overhead variances:

- Expenditure Variance
 - Volume Variance,
 - Fixed Cost Variance.
14. J.K. Ltd. manufactures NXE by mixing three raw materials. For every batch of 100 kg. of NXE, 125 kg. of raw materials are used. In the month of April, 60 batches were prepared to produce an output of 5,600 kg. of NXE. The standard and actual particulars for the month of April, are as follows:

Raw Materials	Standard		Actual		Quantity of Raw Materials Purchased
	Mix	Price per kg.	Mix	Price per Kg.	
	(%)	(₹)	(%)	(₹)	
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

You are required to CALCULATE:

- Material Price variance
- Material Usage Variance

15. Following data is extracted from the books of XYZ Ltd. for the month of January:

(i) Estimation-

Particulars	Quantity (kg.)	Price (₹)	Amount (₹)
Material-A	800	?	--
Material-B	600	30.00	18,000
			--

Normal loss was expected to be 10% of total input materials.

(ii) Actuals-

1480 kg of output produced.

Particulars	Quantity (kg.)	Price (₹)	Amount (₹)
Material-A	900	?	--
Material-B	?	32.50	--
			59,825

(iii) Other Information-

Material Cost Variance = ₹ 3,625 (F)

Material Price Variance = ₹ 175 (F)

You are required to CALCULATE:

- (i) Standard Price of Material-A;
 - (ii) Actual Quantity of Material-B;
 - (iii) Actual Price of Material-A;
 - (iv) Revised standard quantity of Material-A and Material-B; and
 - (v) Material Mix Variance.
16. Paras Synthetics uses Standard costing system in manufacturing of its product 'Star 95 Mask'. The details are as follows;
- | | |
|---|------|
| Direct Material 0.50 Meter @ ₹ 60 per meter | ₹ 30 |
| Direct Labour 1 hour @ ₹ 20 per hour | ₹ 20 |
| Variable overhead 1 hour @ ₹ 10 per hour | ₹ 10 |
| Total | ₹ 60 |

During the month of August, 10,000 units of 'Star 95 Mask' were manufactured.

Details are as follows:

Direct material consumed 5700 meters @ ₹ 58 per meter

Direct labour Hours ? @ ? ₹ 2,24,400

Variable overhead incurred ₹ 1,12,200

Variable overhead efficiency variance is ₹ 2,000 A. Variable overheads are based on Direct Labour Hours.

You are required to calculate the missing data and all the relevant Variances.

ANSWERS/ SOLUTIONS

Answers to the MCQs based Questions

1. (b) 2. (c) 3. (a) 4. (c) 5. (a) 6. (d)
7. (a) 8. (d) 9. (b) 10. (d)

Answers to the Theoretical Questions

- Please refer paragraph 13.3
- Please refer paragraph 13.2
- Please refer paragraph 13.7.1
- Please refer paragraph 13.7.4

Answers to the Practical Questions

1. Basic Calculations

	Standard for 1,000 kg.			Actual for 1,000 kg.		
	Qty.	Rate	Amount	Qty.	Rate	Amount
	Kg.	(₹)	(₹)	Kg.	(₹)	(₹)
A	800*	6	4,800	750	7	5,250
B	400*	4	1,600	500	5	2,500
Total	1,200		6,400	1,250		7,750

(* A- $8 \div 10 \times 1000 = 800$ B- $4 \div 10 \times 1000 = 400$)

Calculation of Variances:

- (a) Material Cost Variance = Std. cost for actual output – Actual cost
MCV = $6,400 - 7,750 = ₹1,350$ (A)

(b) Material Price Variance = $(SP - AP) \times AQ$

$$A = (6 - 7) \times 750 = ₹ 750 (A)$$

$$B = (4 - 5) \times 500 = ₹ 500 (A)$$

$$MPV = ₹ 1,250 (A)$$

(c) Material Usages Variance = $(SQ - AQ) \times SP$

$$A = (800 - 750) \times 6 = ₹ 300 (F)$$

$$B = (400 - 500) \times 4 = ₹ 400 (A)$$

$$MUV = ₹ 100 (A)$$

Check

$$MCV = MPV + MUV$$

$$1,350 (A) = 1,250 (A) + 100 (A)$$

2.

Material	Standard for 10 units			Actual for 10 units		
	Qty. Units	Rate (₹)	Amount (₹)	Qty. units	Rate (₹)	Amount (₹)
X	600	15	9,000	640	17.50	11,200
Y	800	20	16,000	950	18.00	17,100
Z	1,000	25	25,000	870	27.50	23,925
Total	2,400		50,000	2,460		52,225

1. Material Cost Variance = Standard cost – Actual cost

$$= ₹ 50,000 - ₹ 52,225$$

$$MCV = ₹ 2,225 (A)$$

2. Material Price Variance = $(Std. Price - Actual Price) \times Actual Qty.$

$$\text{Material X} = (15 - 17.50) \times 640 = ₹ 1,600 (A)$$

$$\text{Material Y} = (20 - 18) \times 950 = ₹ 1,900 (F)$$

$$\text{Material Z} = (25 - 27.50) \times 870 = ₹ 2,175 (A)$$

$$MPV = ₹ 1,875 (A)$$

3. Material Usage Variance = $(Std. Qty. - Actual Qty.) \times Std. Price$

$$\text{Material X} = (600 - 640) \times 15 = ₹ 600 (A)$$

$$\text{Material Y} = (800 - 950) \times 20 = ₹ 3,000 \text{ (A)}$$

$$\text{Material Z} = (1,000 - 870) \times 25 = ₹ 3,250 \text{ (F)}$$

$$\text{MUV} = ₹ 350 \text{ (A)}$$

$$\text{Check} \quad \text{MCV} = \text{MPV} + \text{MUV}$$

$$₹2,225 \text{ (A)} = ₹1,875 \text{ (A)} + ₹350 \text{ (A)}$$

$$4. \quad \text{Material Mix Variance} = (\text{Revised Std. Qty.} - \text{Actual Qty.}) \times \text{Std. Price}$$

$$\text{Material X} = (615^* - 640) \times 15 = ₹ 375 \text{ (A)}$$

$$\text{Material Y} = (820^* - 950) \times 20 = ₹2,600 \text{ (A)}$$

$$\text{Material Z} = (1,025 - 870) \times 25 = ₹3,875 \text{ (F)}$$

$$\text{MMV} = ₹ 900 \text{ (F)}$$

*Revised Standard Quantity (RSQ) is calculated as follows:

$$\text{Material X} = \frac{2460}{2400} \times 600 = 615 \text{ units}$$

$$\text{Material Y} = \frac{2460}{2400} \times 800 = 820 \text{ units}$$

$$\text{Material Z} = \frac{2460}{2400} \times 1,000 = 1,025 \text{ units}$$

$$5. \quad \text{Material Yield Variance} = (\text{Std. Qty.} - \text{Revised Std. Qty.}) \times \text{Std. Price}$$

$$\text{Material X} = (600 - 615) \times 15 = ₹225 \text{ (A)}$$

$$\text{Material Y} = (800 - 820) \times 20 = ₹400 \text{ (A)}$$

$$\text{Material Z} = (1,000 - 1,025) \times 25 = ₹625 \text{ (A)}$$

$$\text{MYV} = ₹1,250 \text{ (A)}$$

Check

$$\text{MUV} = \text{MMV} + \text{MYV (Or MRUV)}$$

$$₹350 \text{ (A)} = ₹900 \text{ (F)} + ₹1,250 \text{ (A)}$$

or

$$\text{MCV} = \text{MPV} + \text{MMV} + \text{MYV (Or MRUV)}$$

$$₹2,225 \text{ (A)} = ₹1,875 \text{ (A)} + ₹900 \text{ (F)} + ₹1,250 \text{ (A)}$$

3. (i) Actual Price of Material A

Let Actual Price of Material A be 'X'

$$\text{Material Price Variance (A)} = ₹ 105 \text{ (A)}$$

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{AQ}$$

$$(20 - X) \times 70 = 105 \text{ (A)}$$

$$1,400 - 70X = -105$$

$$X = 1,505 \div 70 = 21.5$$

Therefore X (Actual Price) = ₹ 21.5

(ii) Actual Quantity of Material B

Let Actual Quantity of Material B be 'X'

$$\text{Material Cost Variance} = (\text{SQ} \times \text{SP}) - (\text{AQ} \times \text{AP})$$

$$\text{Material Cost Variance} = 275 \text{ (A)}$$

$$\{(60 \times 20) - (70 \times 21.5)\} + \{(40 \times 30) - ('X' \times 30)\} = 275 \text{ (A)}$$

$$\{(1,200 - 1,505) + (1,200 - 30X)\} = -275$$

$$(895 - 30X) = -275$$

$$X = 1,170 \div 30 = 39 \text{ units}$$

(iii) Material Price Variance = (SP – AP) × AQ

$$\text{Material A} = (20 - 21.5) \times 70 = ₹ 105 \text{ (A)}$$

$$\text{Material B} = (30 - 30) \times 39 = ₹ 0$$

$$\text{Total} = ₹ 105 \text{ (A)}$$

(iv) Material Usage Variance = (SQ– AQ) × SP

$$\text{Material A} = (60 - 70) \times 20 = ₹ 200 \text{ (A)}$$

$$\text{Material B} = (40 - 39) \times 30 = ₹ 30 \text{ (F)}$$

$$\text{Total} = ₹ 170 \text{ (A)}$$

(v) Material Mix Variance = (RSQ– AQ) × SP

$$\text{Material A} = \left(\frac{109}{100} \times 60 - 70\right) \times 20 = ₹ 92 \text{ (A)}$$

$$\text{Material B} = \left(\frac{109}{100} \times 40 - 39\right) \times 30 = ₹ 138 \text{ (F)}$$

$$\text{Total} = ₹ 46 \text{ (F)}$$

(vi) Material Yield Variance = (SQ – RSQ) × SP

$$\text{Material A} = \left(60 - \frac{109}{100} \times 60\right) \times 20 = ₹ 108 \text{ (A)}$$

$$\text{Material B} = (40 - \frac{109}{100} \times 40) \times 30 = ₹ 108 \text{ (A)}$$

$$\text{Total} = ₹ 216 \text{ (A)}$$

4. Working Notes:

- (1) Calculation of standard mix of input (assuming Standard input as 100 kg)

	Qty. (Kg)	Price (₹)	Amount (₹)
Chemical A	50	12	600
Chemical B	50	15	750
	100	13.50	1,350
Normal Loss (10%)	(10)		
	90		1,350

- (2) Let the actual input of chemical A be X kg. and the actual price of chemical B be ₹ Y.

Given,

Material yield variance = (Total standard input – Total Actual input) x Standard cost per unit of input

$$= [100 - (70 + X)] \times 13.5 = 135 \text{ (A)}$$

Therefore, X = 40 kg.

Also, Material cost variance = (Standard quantity x Standard price) – (Actual quantity x Actual price)

$$= 1,350 - \{(40 \times 15) + (70 \times Y)\} = 650 \text{ (A)}$$

$$= 1,350 - 600 - 70Y = 650A$$

Therefore, Y = ₹ 20

(i) Material mix variance

= (Revised Std. Quantity* – Actual quantity) x Standard Price

$$\text{Chemical A} = (55 - 40) \times 12 = 180 \text{ (F)}$$

$$\text{Chemical B} = (55 - 70) \times 15 = \underline{225 \text{ (A)}}$$

$$= \underline{₹ 45 \text{ (A)}}$$

*Revised Std. Quantity:

$$\text{Chemical A} = (70 + 40) \times 50\% = 55$$

$$\text{Chemical B} = (70 + 40) \times 50\% = 55$$

(ii) Material usage variance

$$= (\text{Std. qty.} - \text{Actual qty.}) \times \text{Std. price}$$

$$\text{Chemical A} = (50 - 40) \times 12 = 120 \text{ (F)}$$

$$\begin{aligned} \text{Chemical B} &= (50 - 70) \times 15 = \underline{300 \text{ (A)}} \\ &= \underline{\text{₹ } 180 \text{ (A)}} \end{aligned}$$

(iii) Material price variance

$$= (\text{Std. price} - \text{Actual price}) \times \text{Actual qty.}$$

$$\text{Chemical A} = (12 - 15) \times 40 = 120 \text{ (A)}$$

$$\begin{aligned} \text{Chemical B} &= (15 - 20) \times 70 = \underline{350 \text{ (A)}} \\ &= \underline{\text{₹ } 470 \text{ (A)}} \end{aligned}$$

(iv) Actual loss of actual input

$$\text{Actual total input} = 110 \text{ kg.}$$

$$\text{Less: Actual output} = \underline{90 \text{ kg.}}$$

$$\text{Actual loss} = \underline{20 \text{ kg.}}$$

(v) Actual input of chemical A = 40 kg. [As calculated in Working note (2)].

(vi) Actual price per kg. of chemical B = ₹ 20 [As calculated in Working note (2)].

5. For Material Cost Variances

	SQ × SP	AQ × AP	AQ × SP
A	$12,000 \times 4 = 48,000$	$12,500 \times 4.40 = 55,000$	$12,500 \times 4 = 50,000$
B	$18,000 \times 3 = 54,000$	$18,000 \times 2.80 = 50,400$	$18,000 \times 3 = 54,000$
C	$90,000 \times 1 = 90,000$	$88,500 \times 1.20 = 1,06,200$	$88,500 \times 1 = 88,500$
Total	₹ 1,92,000	₹ 2,11,600	₹ 1,92,500

Variances:

$$\text{Material Price Variance} = \text{Actual quantity (Std. price} - \text{Actual price)}$$

$$\text{Or,} \quad = (\text{AQ} \times \text{SP}) - (\text{AQ} \times \text{AP})$$

$$\begin{aligned}\text{Or,} & \quad = ₹ 1,92,500 - ₹ 2,11,600 \\ & \quad = ₹ 19,100 \text{ (A)}\end{aligned}$$

Material Usage Variance = Standard Price (Std. Quantity – Actual Quantity)

$$\text{Or,} \quad = (\text{SP} \times \text{SQ}) - (\text{SP} \times \text{AQ})$$

$$\text{Or,} \quad = ₹ 1,92,000 - ₹ 1,92,500 = ₹ 500 \text{ (A)}$$

For Labour Cost Variance :

	SH × SR	AH × AR	AH × SR
Labour	$(6,000 \times 3) \times ₹ 8$ $= 1,44,000$	$2,500 \times 12 = 30,000$ $15,000 \times 8 = 1,20,000$	$17,500 \times 8 =$ $1,40,000$
Total	₹ 1,44,000	₹ 1,50,000	₹ 1,40,000

Variances:

Labour Rate Variance: Actual Hours (Std. Rate – Actual Rate)

$$\text{Or,} \quad = (\text{AH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

$$\begin{aligned}\text{Or,} & \quad = ₹ 1,40,000 - ₹ 1,50,000 \\ & \quad = ₹ 10,000 \text{ (A)}\end{aligned}$$

Labour Efficiency Variance: Standard Rate (Std. Hours – Actual Hours)

$$\text{Or,} \quad = (\text{SR} \times \text{SH}) - (\text{SR} \times \text{AH})$$

$$\begin{aligned}\text{Or,} & \quad = ₹ 1,44,000 - ₹ 1,40,000 \\ & \quad = ₹ 4,000 \text{ (F)}\end{aligned}$$

6. Material variances

1. Material cost variance

$$= (\text{Std. qty for actual output}^* \times \text{Std. price}) - (\text{Actual qty.} \times \text{Actual price})$$

$$= (18,000 \times 4) - (19,000 \times 4.40)$$

$$= 72,000 - 83,600 = ₹ 11,600 \text{ (A)}$$

$$^* \text{ Std. qty. for actual output} = 1,800 \times 10 = 18,000 \text{ units}$$

2. Material price variance

$$= (\text{Std. price} - \text{Actual price}) \times \text{Actual qty.}$$

$$= (4 - 4.40) \times 19,000$$

$$= 0.40 \times 19,000 = ₹ 7,600 \text{ (A)}$$

3. Material usage variance

$$\begin{aligned}
 &= (\text{Std. qty.} - \text{Actual qty.}) \times \text{Std. price} \\
 &= (18,000 - 19,000) \times 4 \\
 &= 1,000 \times 4 = ₹ 4,000 \text{ (A)}
 \end{aligned}$$

Labour variances**1. Labour cost variance**

$$\begin{aligned}
 &= (\text{Std. hours for actual output}^* \times \text{Std. price}) - \text{Actual cost} \\
 &= (4,500 \times 4) - 24,750 \\
 &= 18,000 - 24,750 = ₹ 6,750 \text{ (A)}
 \end{aligned}$$

$$^*\text{Std. hours for actual output} = 1,800 \times 2.5 = 4,500 \text{ hrs.}$$

2. Labour rate variance

$$\begin{aligned}
 &= (\text{Std. rate} - \text{Actual rate}) \times \text{Actual hrs.} \\
 &= (4 - 5) \times 4,950 = ₹ 4,950 \text{ (A)}
 \end{aligned}$$

3. Labour efficiency variance

$$\begin{aligned}
 &= (\text{Std. hrs. for actual output} - \text{Actual hrs.}) \times \text{Std. rate} \\
 &= (4,500 - 4,950) \times 4 = ₹ 1,800 \text{ (A)}
 \end{aligned}$$

7. Production/ Overhead volume variance (only for fixed overhead)

Fixed Overhead Volume Variance:

$$\begin{aligned}
 &= \text{Absorbed overhead} - \text{Budgeted Overhead} \\
 &= (₹5 \times 15,000 \text{ units}) - (₹5 \times 20,000 \text{ units}) \\
 &= ₹75,000 - ₹1,00,000 = ₹25,000 \text{ (Adverse)}
 \end{aligned}$$

Overhead expense variances

For variable overhead:

$$= \text{AQ} (\text{SR} - \text{AR}) = 15,000 \text{ units} (₹10 - ₹10) = \text{Nil}$$

For fixed overhead:

$$\begin{aligned}
 &= \text{Budgeted Overhead} - \text{Actual Overhead} \\
 &= (₹5 \times 20,000 \text{ units}) - (\text{Total overhead} - \text{Variable overhead}) \\
 &= (₹5 \times 20,000 \text{ units}) - (₹3,00,000 - ₹10 \times 15,000 \text{ units})
 \end{aligned}$$

$$= ₹1,00,000 - (₹3,00,000 - ₹1,50,000)$$

$$= ₹1,00,000 - ₹1,50,000 = ₹ 50,000 \text{ (Adverse)}$$

8. Working Notes:

	Budget	Actual
1. Working hours per month	24,000	20,160
2. Production units per month = (Budget 24,000 ÷ 4 hrs, Actual given)	6,000	5,305
3. Standard fixed overhead rate per unit = ₹ 1,44,000 ÷ 6,000 = ₹ 24		
4. Standard fixed overhead rate per hour = ₹1,44,000 ÷ 24,000 = ₹ 6		
5. Standard fixed overhead rate per day = ₹ 1,44,000 ÷ 25 = ₹ 5,760		

Fixed Overhead Variances:

Actual Fixed overhead incurred = ₹ 1,42,000 (given)

Budgeted fixed overhead for the period = ₹ 1,44,000.

Standard fixed overhead for actual production

= (Standard output for actual time × Standard Fixed Overhead per unit)

= 5,305 × ₹ 24 = ₹ 1,27,320.

Variances:

(i) F.O. Expenditure Variance = (Budgeted fixed overhead – Actual fixed overhead)

$$= 1,44,000 - 1,42,000 = ₹ 2,000 \text{ (F)}$$

(ii) Total Volume Variance = (Standard fixed overhead – Budgeted fixed overhead)

$$= 1,27,320 - 1,44,000 = ₹16,680 \text{ (A)}$$

(iii) Fixed overhead variance = (Standard fixed overhead – Actual Fixed overhead)

$$= 1,27,320 - 1,42,000 = ₹14,680 \text{ (A)}$$

Alternatively:

$$\text{Expenditure Variance} + \text{Volume Variance} = 2,000 \text{ (F)} + 16,680 \text{ (A)} = ₹14,680 \text{ (A)}$$

9. For fixed overhead variances:

Actual F.O. incurred (given) ₹12,000

Budgeted F.O. for the period ₹10,000

Standard F.O. for production (Standard output for actual time × Standard Fixed Overhead per unit)

2,100 units × {₹10,000 ÷ 2,000 units} ₹10,500

- (i) Fixed Overhead Variance = Standard F.O. – Actual F.O.
 = ₹10,500 – ₹12,000
 = ₹1,500 (A)
- (ii) F.O. Expenditure Variance = Budgeted F.O. – Actual F.O.
 = ₹10,000 – ₹12,000
 = ₹2,000 (A)
- (iii) F.O. Volume Variance = Standard F.O. – Budgeted F.O.
 = ₹10,500 – ₹10,000 = ₹500 (F)

10. Basic Calculations:

Standard hours per unit = $\frac{\text{Budgeted hours}}{\text{Budgeted units}} = \frac{30,000}{30,000} = 1 \text{ hour}$

Std. hrs. for actual output = 32,500 units × 1 hr = 32,500

Standard overhead rate per hour = $\frac{\text{Budgeted overhead}}{\text{Budgeted hours}}$

For fixed overhead = $\frac{45,000}{30,000} = ₹1.50 \text{ per hour}$

For variable overhead = $\frac{60,000}{30,000} = ₹2 \text{ per hour}$

Std. F.O. rate per day = ₹45,000 ÷ 25 days = ₹1,800

Recovered overhead = Std. hrs. for actual output × St. rate

For fixed overhead = 32,500 hrs. × ₹1.50 = ₹48,750

For variable overhead	= 32,500 hrs. × ₹2 = ₹65,000
Standard overhead	= Actual hours × Std. rate
For fixed overhead	= 33,000 × 1.50 = ₹49,500
For variable overhead	= 33,000 × 2 = ₹66,000
Revised budget hours	= $\frac{\text{Budgeted hours}}{\text{Budgeted days}} \times \text{Actual days}$
	= $\frac{30,000}{25} \times 26 = 31,200 \text{ hours}$

Revised budgeted overhead (for fixed overhead) = 31,200 × 1.50 = ₹46,800

Calculation of variances

Fixed Overhead Variances:

- (i) F.O. cost Variance = Recovered Overhead – Actual Overhead
= 48,750 – 50,000
= ₹1,250 (A)
- (ii) F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead
= 45,000 – 50,000
= ₹ 5,000 (A)
- (iii) F.O. Volume Variance = Recovered Overhead – Budgeted Overhead
= 48,750 – 45,000
= ₹ 3,750 (F)
- (iv) F.O. Efficiency Variance = Recovered Overhead – Standard Overhead
= 48,750 – 49,500 = ₹750 (A)
- (v) F.O. Capacity Variance = Standard Overhead- Revised Budgeted Overhead
= 49,500-46800 = ₹ 2,700 (F)
- (v) Calendar Variance = (Actual Days - Budget Days) × St. rate per day.
= (26 – 25) × 1,800 = ₹1,800 (F)

Variable Overhead Variances

- (i) V.O. Cost variance = Recovered Overhead – Actual Overhead
= 65,000 – 68,000 = ₹ 3,000 (A)

- (ii) V.O. Expenditure Variance = Standard Overhead – Actual Overhead
 $= 66,000 - 68,000 = ₹ 2,000 (A)$
- (iii) V.O. Efficiency Variance = Recovered Overhead – Standard Overhead
 $= 65,000 - 66,000 = ₹ 1,000 (A)$

Check

- (i) F.O. Cost Variance = Expenditure variance + Volume variance
 $1,250 (A) = 5,000 (A) + 3,750 (F)$
- (ii) F.O. Volume Variance = $\frac{\text{Efficiency}}{\text{Variance}} + \frac{\text{Capacity}}{\text{Variance}} + \frac{\text{Calendar}}{\text{Variance}}$
 $3,750 (F) = 750 (A) + 2,700 (F) + 1,800 (F)$
- (iii) V.O. Cost Variance = Expenditure Variance + Efficiency Variance
 $3,000 (A) = 2,000 (A) + 1,000 (A).$

11. For Fixed Overhead Variances

Actual fixed overhead incurred	₹ 31,000
Budgeted fixed overhead for the period	₹ 30,000
Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit) ($₹ 30,000 \div 20,000 \text{ units} \times 22,000$)	₹ 33,000

Computation of Variances:

- (i) *Fixed overhead expenditure variance:*
 $= \text{Budgeted fixed overhead} - \text{Actual fixed overhead}$
 $= ₹ 30,000 - ₹ 31,000 = ₹ 1,000 (A)$
- (ii) *Fixed overhead volume variance:*
 $= \text{Standard fixed overhead} - \text{Budgeted fixed overhead}$
 $= ₹ 33,000 - ₹ 30,000 = ₹ 3,000 (F)$
- (iii) *Fixed overhead variance:*
 $= \text{Standard fixed overhead} - \text{Actual fixed overhead}$
 $= ₹ 33,000 - ₹ 31,000 = ₹ 2,000 (F)$

12. Working Notes:

1. Calculation of standard variable overhead per unit

$$= \frac{\text{Budgeted variable overhead}}{\text{Budgeted production}} = \frac{10,000}{400} = ₹ 25 \text{ per unit}$$
2. Calculation of standard variable overhead per hour

$$= \frac{\text{Budgeted variable overhead}}{\text{Budgeted man hours}} = \frac{10,000}{8,000} = ₹ 1.25 \text{ per hour}$$
3. Calculation of Std. variable overhead for actual output

$$= \text{Actual output} \times \text{Std. variable overhead per unit}$$

$$= 360 \text{ units} \times ₹ 25 = ₹ 9,000$$
4. Calculation of Budgeted variable overhead based on actual hours worked

$$= \text{Actual hours worked} \times \text{Std. variable overhead per hour}$$

$$= 7,000 \times 1.25 = ₹ 8,750$$
5. Calculation of standard hours for actual output

$$= \text{Actual output} \times \text{Std. hours per unit}$$

$$= 360 \text{ units} \times 20 \text{ hours} = 7,200 \text{ hours}$$
- (i) **Variable overhead cost variance**

$$= \text{Std. variable overhead for actual output} - \text{Actual Variable Overheads}$$

$$= 9,000 - 9,150 = ₹ 150 \text{ (A)}$$
- (ii) **Variable overhead expenditure variance**

$$= \text{Std. overhead for Actual hours} - \text{Actual Overhead}$$

$$= 8,750 - 9,150 = ₹ 400 \text{ (A)}$$
- (iii) **Variable overhead efficiency variance**

$$= (\text{Std. hours for actual output} - \text{Actual hours}) \times \text{Std. rate per hour}$$

$$= (7,200 - 7,000) \times 1.25 = ₹ 250 \text{ (F)}$$

13. For Fixed overheads Variances:

Actual fixed overhead incurred = ₹ 1,56,000

Budgeted fixed overhead for the period = 1,50,000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

$(6,300 \text{ hrs} \times 27 \text{ days} \times 0.9) \times (\text{₹ } 1,50,000 \div 1,50,000 \text{ units}) = \text{₹ } 1,53,090$

- (a) Fixed Overhead Expenditure Variance = Budgeted fixed overhead – Actual fixed overhead
 $= \text{₹ } 1,50,000 - \text{₹ } 1,56,000 = \text{₹ } 6,000 \text{ (A)}$
- (b) Fixed Overhead Volume Variance = Standard fixed overhead – Budgeted fixed overhead
 $= \text{₹ } 1,53,090 - \text{₹ } 1,50,000 = \text{₹ } 3,090 \text{ (F)}$
- (c) Fixed Overhead Variance = Standard fixed overhead – Actual fixed overhead
 $= \text{₹ } 1,53,090 - \text{₹ } 1,56,000 = \text{₹ } 2,910 \text{ (A)}$

14. Actual material used = 125 kg × 60 = 7,500 kg.

Actual cost of actual material used (AQ × AR)			(₹)
A	(60%)	4,500 kg × ₹21 =	94,500
B	(20%)	1,500 kg × ₹ 8 =	12,000
C	(20%)	<u>1,500 kg × ₹ 6 =</u>	<u>9,000</u>
		<u>7,500</u>	<u>1,15,500</u>

Standard cost of actual material used (AQ × SR)			(₹)
A		4,500 kg × ₹20 =	90,000
B		1,500 kg × ₹10 =	15,000
C		<u>1,500 kg × ₹ 5 =</u>	<u>7,500</u>
		<u>7,500</u>	<u>1,12,500</u>

Standard cost of material, if it had been used in standard proportion
 (Standard Proportion × Standard Rate)

			(₹)
A	(50%)	3,750 kg × ₹20 =	75,000
B	(30%)	2,250 kg × ₹10 =	22,500
C	(20%)	<u>1,500 kg × ₹ 5 =</u>	<u>7,500</u>
		<u>7,500</u>	<u>1,05,000</u>

Standard cost of production (SQ for actual production × SR)

Standard cost of output for 100 kg:			(₹)
A	62.50 kg × ₹20 =	1,250	
B	37.50 kg × ₹10 =	375	
C	<u>25.00 kg × ₹ 5 =</u>	<u>125</u>	
	<u>125.00</u>	<u>1,750</u>	

Standard cost for output of 5,600 kg.

$$= \frac{1,750}{100} \text{ kg} \times 5,600 \text{ kg} = ₹ 98,000$$

Material Price Variance = Standard cost of actual material used – Actual cost of actual material used = ₹ 1,12,500 – ₹ 1,15,500 = ₹ 3,000 (A)

Material Usage Variance = Standard cost of production – Standard cost of actual material used = ₹ 98,000 – ₹ 1,12,500 = ₹ 14,500 (A)

Note: Material Price Variance can be calculated at the time of purchase as well. In that case, material variance will be as follows:

Actual cost of material purchased

A	5,000 kg × ₹ 21 =	₹ 1,05,000
B	2,000 kg × ₹ 8 =	₹ 16,000
C	1,200 kg × ₹ 6 =	<u>₹ 7,200</u>
		<u>₹ 1,28,200</u>

Standard cost of material purchased

A	5,000 kg × ₹ 20 =	₹ 1,00,000
B	2,000 kg × ₹ 10 =	₹ 20,000
C	1,200 kg × ₹ 5 =	<u>₹ 6,000</u>
		<u>₹ 1,26,000</u>

Material Price variance (if calculated at the time of purchase)

= Standard cost of actual material used – Actual cost of actual material used

= ₹ 1,26,000 – ₹ 1,28,200 = ₹ 2,200 (A)

$$\begin{aligned}
 15. \quad (i) \quad \text{Material Cost Variance (A + B)} &= \{(SQ \times SP) - (AQ \times AP)\} \\
 ₹3,625 &= (SQ \times SP) - ₹59,825 \\
 (SQ \times SP) &= ₹ 63,450 \\
 (SQ_A \times SP_A) + (SQ_B \times SP_B) &= ₹ 63,450 \\
 (940 \text{ kg} \times SP_A) + (705 \text{ kg} \times ₹30) &= ₹ 63,450 \\
 (940 \text{ kg} \times SP_A) + ₹21,150 &= ₹ 63,450 \\
 (940 \text{ kg} \times SP_A) &= ₹ 42,300 \\
 SP_A &= \frac{₹ 42,300}{940 \text{ kg}}
 \end{aligned}$$

Standard Price of Material-A = ₹ 45

Working Note:

SQ i.e. quantity of inputs to be used to produce actual output

$$= \frac{1,480 \text{ kg}}{90\%} = 1,645 \text{ kg}$$

$$SQ_A = \frac{800 \text{ kg}}{(800 + 600)} \times 1,645 \text{ kg} = 940 \text{ kg}$$

$$SQ_B = \frac{600 \text{ kg}}{(800 + 600)} \times 1,645 \text{ kg} = 705 \text{ kg}$$

$$\begin{aligned}
 (ii) \quad \text{Material Price Variance (A + B)} &= \{(AQ \times SP) - (AQ \times AP)\} \\
 ₹ 175 &= (AQ \times SP) - ₹ 59,825 \\
 (AQ \times SP) &= ₹ 60,000 \\
 (AQ_A \times SP_A) + (AQ_B \times SP_B) &= ₹ 60,000 \\
 (900 \text{ kg} \times ₹ 45 \text{ (from (i) above)}) & \\
 + (AQ_B \times ₹ 30) &= ₹ 60,000 \\
 ₹ 40,500 + (AQ_B \times ₹ 30) &= ₹ 60,000 \\
 (AQ_B \times ₹ 30) &= ₹ 19,500 \\
 AQ_B &= \frac{19,500}{30} = 650 \text{ kg}
 \end{aligned}$$

Actual Quantity of Material B = 650 kg.

$$(iii) (AQ \times AP) = ₹ 59,825$$

$$(AQ_A \times AP_A) + (AQ_B \times AP_B) = ₹ 59,825$$

$$(900 \text{ kg} \times AP_A) + (650 \text{ kg (from (ii) above)} \times ₹ 32.5) = ₹ 59,825$$

$$(900 \text{ kg} \times AP_A) + ₹ 21,125 = ₹ 59,825$$

$$(900 \text{ kg} \times AP_A) = ₹ 38,700$$

$$AP_A = \frac{38,700}{900} = 43$$

$$\text{Actual Price of Material-A} = ₹ 43$$

$$(iv) \text{ Total Actual Quantity of Material-A and Material-B}$$

$$= AQ_A + AQ_B = 900 \text{ kg} + 650 \text{ kg (from (ii) above)}$$

$$= 1,550 \text{ kg}$$

Now,

$$\text{Revised } SQ_A = \frac{800 \text{ kg}}{(800 + 600)} \times 1,550 \text{ kg} = \mathbf{886 \text{ kg}}$$

$$\text{Revised } SQ_B = \frac{600 \text{ kg}}{(800 + 600)} \times 1,550 \text{ kg} = \mathbf{664 \text{ kg}}$$

$$(v) \text{ Material Mix Variance (A + B) } = \{(RSQ \times SP) - (AQ \times SP)\}$$

$$= \{(RSQ_A \times SP_A) + (RSQ_B \times SP_B) - 60,000\}$$

$$= (886 \text{ kg (from (iv) above)} \times ₹ 45 \text{ (from (i) above)})$$

$$+ (664 \text{ kg (from (iv) above)} \times ₹ 30) - ₹ 60,000$$

$$= (39,870 + 19,920) - 60,000 = \mathbf{₹ 210 \text{ (A)}}$$

16. (i) Material Variances

	Budget			Std. for actual			Actual		
	Quantity	Price (₹)	Amount (₹)	Quantity	Price (₹)	Amount (₹)	Quantity	Price (₹)	Amount (₹)
Material	0.5	60	30	5,000	60	3,00,000	5,700	58	3,30,600

$$\text{Material Cost Variance} = (\text{SQ} \times \text{SP} - \text{AQ} \times \text{AP})$$

$$3,00,000 - 3,30,600 = ₹ 30,600(\text{A})$$

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \text{ AQ}$$

$$(60 - 58) 5,700 = ₹ 11,400 (\text{F})$$

$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \text{ SP}$$

$$(5,000 - 5,700) 60 = ₹ 42,000 (\text{A})$$

(ii) Variable Overheads variances

Variable overhead cost Variance = (Standard variable overhead – Actual Variable Overhead)

Standard Variable Overheads: 10,000 units \times 10 = 1,00,000

$$(1,00,000 - 1,12,200) = ₹ 12,200(\text{A})$$

Variable overhead Efficiency Variance = (Standard Hours – Actual Hours) \times Standard Rate per Hour

Let Actual Hours be 'X'

$$(10,000 - X) \times 10 = 2,000 (\text{A})$$

$$1,00,000 - 10X = -2,000$$

$$X = 1,02,000 \div 10$$

Therefore, Actual Hours (X) = 10,200

Variable overhead Expenditure Variance = (Variable Overhead at Actual Hours - Actual Variable Overheads)

$$10,200 \times 10 - 1,12,200 = ₹ 10,200 (\text{A})$$

(iii) Labour variances

	Budget			Std. for actual			Actual		
	Hours	Rate (₹)	Amount (₹)	Hours	Rate (₹)	Amount (₹)	Hours	Rate (₹)	Amount (₹)
Labour	1	20	20	10,000	20	2,00,000	10,200	22	2,24,400

Actual Rate = ₹ 2,24,400 ÷ 10,200 hours = ₹22

Labour Cost Variance = (SH × SR) – (AH × AR)

10,000 × 20 – 10,200 × 22 = ₹ 24,400 (A)

Labour Rate Variance = (SR – AR) × AH

(20 – 22) × 10,200 = ₹ 20,400 (A)

Labour Efficiency Variance = (SH – AH) × SR

(10,000 – 10,200) × 20 = ₹ 4,000 (A)